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WHITELAW (E. W.) & PERERA (S. F. H.). **Report of the Commission of the Rubber industry in Ceylon.**—*Ceylon Sess. Pap.*, xviii, xii+137 pp., 8 pl., 1 fig., 1947. Rs. 3.50.

On pp. 28–30 of this report it is stated that *Oidium* leaf disease [*O. heveae*: *R.A.M.*, xxvi, p. 262] constitutes a grave menace to the better rubber-growing parts of Ceylon, the damage caused by other diseases being insignificant in comparison. Already, nearly 175,000 acres of rubber have fallen into an uneconomic condition, and of this total *O. heveae* is responsible for at least 110,000 acres. Rubber which 20 years ago gave 500 lb. per acre now yields under 200 lb., and at the highest elevations the trees are rapidly dying. The disease attacks leaves 7 to 21 days old, and as an affected leaf expands it shrivels and falls. There is great variation in the intensity of attack, some trees losing 100 and others only 25 per cent. of their foliage. If more than 50 per cent. of the foliage falls, the tree produces new leaves which may also be attacked. At elevations under 700 ft. the disease is active only for four to six weeks every year, and in such cases the trees recover, though with reduced yielding ability. Above 700 ft. it is possible for infection to remain active throughout the year, and a tree may produce and immediately lose six foliations per annum. This continuous defoliation has caused bark renewals to become static and yields to fall to uneconomic levels; further, it is certainly killing the trees.

Sulphur dusting at first appeared to be highly successful. Areas riddled with the disease assumed, immediately after treatment, dense and, seemingly, disease-free foliage. The practice became general, and it was thought the question of control had been solved. Gradually, however, it became apparent that the treatment was becoming less effective, and the most that can be said to-day is that it is mitigating the situation to some extent. Areas formerly regarded as immune from serious attack cannot be so considered any longer, and the disease, which at one time caused no appreciable damage at elevations under 1,000 to 1,200 ft., has now begun to cause widespread alarm at elevations down to 500 ft. or under. Thus *O. heveae* appears to be adapting itself to lower elevations. Also, cases have been reported recently in which fully mature leaves have been attacked and killed. Possibly, new and more virulent strains of the fungus are being developed.

JONES (P. C. T.) & MOLLISON (J. E.). **A technique for the quantitative estimation of soil micro-organisms.**—*J. gen. Microbiol.*, ii, 1, pp. 54–69, 2 pl., 1 fig., 1948.

A new technique for counting soil micro-organisms is described. A 2·58 gm. soil sample is suspended in 50 ml. 1·5 per cent. molten agar from which small drops are removed and allowed to solidify as thin films on a haemocytometer slide of 0·1 mm. depth. The films are removed to an ordinary slide, dried slowly at room temperature, and stained for one hour in a solution containing 15 ml. 5 per cent. aqueous phenol, 1 ml. 1 per cent. aniline blue W.S., and 4 ml. glacial acetic acid, permanent

preparations being made by dehydration in 95 per cent. ethanol and mounting in euparal. Twenty random fields of known size on each of four replicate slides are counted under oil immersion. Multiplication by an appropriate conversion factor will give the number of organisms per gm. of soil.

The method provides a more accurate technique for estimating the quantity of bacteria and fungi, and is particularly suitable for comparative analyses of field soils and for soils undergoing experimental treatment. Significantly fewer pieces of fungus mycelium were counted in soils to which mineral fertilizers had been added than in those receiving farmyard manure or none. By using nutrient agar instead of plain agar for the soil dilutions and by incubating the soil films for some days in a damp chamber before drying and staining, very satisfactory preparations of developing bacterial colonies and of colonies of Actinomycetes, which stained most successfully, were obtained. By this means it should be possible to calculate the relative frequency of dead and living organisms.

HASHIOKA (Y.). **The sick soil of Castor Beans (a preliminary report).**—*J. Soc. trop. Agric.*, xvi, pp. 105–109, 1 pl., 1944. [Japanese. Received June, 1948.]

Sakuma, the most widespread variety of castor beans [*Ricinus communis*] in Formosa, almost died before maturity when the plants were raised twice consecutively in the same plot. When the plants were grown in pots to which was added a small quantity of the sick soil of the above-mentioned plot or its filtrate, most of them died within two months, whereas all grew normally in soil of the ordinary rice fields, heat-sterilized sick soil, and rice soil with the additional sick soil or a Berkefeld filtrate of the same. Hence the soil sickness of castor beans under continuous cultivation appears to be due to soil-inhabiting parasitic organisms, chiefly *Fusarium ricini* [*R.A.M.*, xvii, p. 135] and to a lesser extent *Bacterium* [*Xanthomonas*] *solanacearum*. The varieties endemic to tropical Asia are resistant to soil sickness.

OLIVE (L. S.). **Taxonomic notes on Louisiana fungi—I.**—*Mycologia*, xl, 1, pp. 6–20, 3 pl., 1948.

The present paper, the first of a series planned to present new data on the fungal flora of Louisiana, includes descriptions of several new genera and species of parasitic fungi as well as new distributional and host records for several other species. Mention may be made of *Microsphaera alni* var. *cinnamomi* var. nov., parasitizing young seedlings of *Camphora cinnamomum* Nees & Eberm. [? *Cinnamomum camphora*].

VIÉGAS (A. P.). **Alguns micetos brasilieros.** [Some Brazilian fungi.]—*Bragantia, S. Paulo*, vii, 2, pp. 25–48, 13 pl., 1947.

This further instalment of the author's studies on Brazilian fungi [cf. *R.A.M.*, xxvii, p. 100, and next abstract] comprises 13 records, including six new species and one new combination. *Roesleria brasiliana* n.sp. was collected on the cortex of *Spondias lutea* in Minas Gerais and *Aschersonia turbinata* on coccids [ibid., xv, p. 216] infesting guava leaves in Maranhao.

VIÉGAS (A. P.). **Alguns fungos encontrados em S. Paulo, Minas, e Espírito Santo.** [Some fungi encountered in São Paulo, Minas, and Espírito Santo.]—*Bragantia, S. Paulo*, vii, 4, pp. 107–124, 10 pl., 1947.

Included in this further contribution to the knowledge of Brazilian fungi [see preceding abstract], comprising ten species of which four are new, is *Ustilaginoidea oryzae* [*U. virens*] on rice [*R.A.M.*, xxvi, p. 125].

Lentz (P. L.) & Stevenson (J. A.). **A résumé of the fungus collections of George W. Carver.**—*Plant Dis. Reptr*, xxxii, 5, pp. 195–215, 1948. [Mimeographed.]

A list is given of the fungus collections of the late G. W. Carver of Tuskegee Institute, Alabama, comprising one Myxomycete, six Phycomycetes, 131 Ascomycetes, 54 Basidiomycetes, and 156 Fungi Imperfecti. Dr. Carver was a collaborator of the United States Plant Disease Survey and several of the specimens are of pathological interest.

Murrill (W. A.). **Florida Polypores.**—*Lloydia*, x, 4, pp. 242–280, 1947.

This annotated list of Florida Polyporaceae [*R.A.M.*, xviii, p. 422] includes eight new combinations and is accompanied by a key to the 53 genera in four tribes and species keys to the genera. The classification followed is that used by the author in North American Flora, vol. ix, parts 1 and 2, and in various papers, but for general convenience both the old and the new names are used.

Steyaert (R. L.). **Quelques Pestalotia de la flore belge.** [Some species of *Pestalotia* in the Belgian flora.]—*Bull. Jard. bot. Brux.*, xix, 1, pp. 65–72, 2 figs., 1948.

This emended study of species of *Pestalotia* deposited in the herbarium of the Botanical Garden at Brussels and originally described or named by Westendorp and Mlle Libert includes descriptions of *P. ilicis* and *P. sydowiana* (considered by the author as synonymous with *P. macrotricha* in agreement with Wollenweber and Hochapfel [*R.A.M.*, xvi, p. 191]).

Thomas (K. M.) & Ramakrishnan (T. S.). **Studies in the genus Phytophthora—II.**—*Proc. Indian Acad. Sci.*, Sect. B, xxvii, 3, pp. 55–73, 1 fig., 1948.

Isolates of *Phytophthora* from *Ricinus communis*, *Agave wightii*, and *Artocarpus incisa*, and authentic cultures of *P. parasitica*, its var. *piperina* [*R.A.M.*, xiv, p. 717], and *P. colocasiae* [ibid., xxiv, p. 340] were studied in detail in single-strain and paired cultures in different combinations [cf. ibid., xxvii, p. 159].

The isolates from the above-mentioned hosts readily combined with *P. parasitica* and its var. *piperina* and *P. colocasiae*, forming oospores of the same type as those of *P. palmivora* and *P. parasitica* and falling within the range of dimensions recorded for these species. From a critical examination of the criteria used for the classification of the species under discussion, viz., nature of growth on culture media, temperature relations, size and shape of sporangia and chlamydospores, facility of formation of sexual bodies and their dimensions, the antheridial type, and the pathogenicity of the isolates, it is concluded that no significant interspecific differences exist. All were capable of growth at 35° C.

The specific affinity between *P. parasitica*, its var. *piperina*, and *P. colocasiae* is demonstrated by the readiness of their combination to form oospores. It is proposed, therefore, to merge all three species (*P. colocasiae*, *P. palmivora*, and *P. parasitica* and its varieties) in one, for which the name of *P. colocasiae* is proposed on grounds of priority, a slightly emended description being given.

Ramon (G.), Manil (P.), & Richou (R.). **De l'action des complexes antagonistes sur certains virus des plantes.** [Concerning the action of antagonistic complexes on certain plant viruses.]—*C. R. Acad. Sci., Paris*, ccxxvi, 5, pp. 367–371, 1948.

In small-scale in vitro experiments culture filtrates of *B*[*acillus*] *subtilis* exerted a markedly neutralizing action on the tobacco necrosis virus, while a similar but weaker effect was produced by those of *Actinomyces* [*Streptomyces*] *griseus*. Neither of these complexes inactivated the tobacco mosaic virus, but a culture filtrate of *Aspergillus niger* did so, as already shown by Fulton [*R.A.M.*, xxiii, p. 55].

Markham (R.), Smith (K. M.), & Wyckoff (R. W. G.). **Molecular arrangement in Tobacco necrosis virus crystals.**—*Nature, Lond.*, clxi, 4098, pp. 760–761, 3 figs., 1948.

Further electron micrographs of the tobacco necrosis virus [*R.A.M.*, xxvi, p. 358] recorded the regular molecular distribution over several faces of polyhedra of this virus, thereby demonstrating their truly crystalline structure. The preparations were made, as in the earlier work, but with palladium instead of gold as the shadowing material. The way molecular alinement follows the crystal outlines in these photographs demonstrates that the original structure is preserved during dehydration. Nevertheless, necrosis virus crystals probably contain water of crystallization, the loss of which may produce distortions in the molecular array and shrinkage in cell dimensions. However, the principal face of the crystals in the present photographs has a net which is square within the limits of experimental error.

The photographs show that the symmetry is probably pseudocubic. The crystals appear to be bounded by a top cube face and four octahedra, the tetramolecular unit cube having an edge length, measured along the diagonal of the square net, of *ca* 340 Å. As several strains of the necrosis virus have been described, it is important to know whether the same type of virus has been used for X-ray examination by Crowfoot and Schmidt (*Nature, Lond.*, clv, p. 504, 1945) and electron microscopy. There is some evidence that the crystals subjected to X-ray analysis were different from those photographed in the electron microscope. Further search is being made for crystals which will establish definitely whether the close-packed arrangement observed by the authors is correct.

Cuzin (J.) & Schwartz (T.). **Études d'épidémiologie statistique de la mosaïque du Tabac. II. Essai d'analyse causale du taux d'endémie.** [Studies on the statistical epidemiology of Tobacco mosaic. II. Attempt at a causal analysis of the endemic incidence.]—*Ann. Inst. Pasteur*, lxxiii, 11, pp. 1106–1113, 1947.

In further studies at the Tobacco Institute, Bergerac, Dordogne, on the statistical epidemiology of the tobacco mosaic virus [*R.A.M.*, xxvi, p. 423], in six plots of seedlings transplanted on infested soil, the effect of three different treatments was investigated, namely, (1) eradication of plants of the preceding year's crop after harvesting the leaves and stems (plots one and six); (2) a winter application of ammonium sulphate at 400 kg. per ha (plots one, two, and three); and (3) two treatments with DDT, the first by sprinkling over the soil nine days before transplanting, and the second by watering, immediately before the operation, the holes destined for each plant (plots one and two). The following percentages of infection had developed 26 days after infection in the plots treated by (*a*) eradication of previous season's crop, 1·9; (*b*) the same plus DDT and ammonium sulphate, 7·1; (*c*) ammonium sulphate, 9·6; (*d*) the same plus DDT, 5·3; and (*e*) controls, 1·2.

Rapid plant growth tends to promote heavy mosaic infection, a fact that may explain the high disease incidence in the ammonium sulphate-treated plots.

Tsui (C.). **The effect of zinc on water relation and osmotic pressure of the Tomato plant.**—*Amer. J. Bot.*, xxxv, 5, pp. 309–311, 1948.

In experiments carried out in the Botany Department of the University of Wisconsin to determine the physiological causes of little leaf, one of the effects of zinc deficiency [*R.A.M.*, xv, p. 730; xxvi, p. 316], tomato plants of the variety John Baer were grown in culture solutions deficient in zinc. It was found that they developed simultaneously a significant decrease in water content, a retardation of growth, and a high osmotic pressure. The addition of zinc increased the water content and growth two days after application.

Robinson (W. B.), Schroeder (W. T.), Stotz (E.), & Kertesz (Z. I.). **Relation of copper-containing fungicides to the ascorbic acid and copper content of Tomato juice.**—*Bull. N.Y. St. agric. Exp. Sta.*, 725, pp. 3–18, 1947.

The results of tests conducted in 1944 at Geneva and Lincoln, New York, indicated that the copper content of tomato juice obtained from plants sprayed against early blight (*Alternaria solani*) with various copper-containing fungicides, particularly microgel (tribasic copper sulphate), and even that of peeled tomato from sprayed plots was considerably higher than the copper content of the unsprayed control. Microgel (applied at a concentration equivalent to 4 lb. of copper per acre) gave 50 per cent. average infection against 41 per cent. for Bordeaux mixture (8–4–100 at the same rate of copper per acre) and 90 per cent. for the control.

Thorough washing usually removed over 50 per cent. of the copper spray residue, and if copper spraying is put into wide practice special attention should be given to washing. The increased copper content of tomato juice has a detrimental effect on the ascorbic acid content. The oxidation of ascorbic acid by copper seems to occur only in the presence of atmospheric oxygen during processing, and once the oxygen dissolved in the juice or that contained in the head space of the container is used up, the amount of copper present has no effect on the loss of ascorbic acid during storage in the can. Some of the copper contained in the juice is plated out on the inside of the can during storage, so that analyses of the stored juice will not give a true value for the copper content at the time of processing. The copper sprays cause no significant changes in the flavour and colour of the juice.

Mullett (R. A.). **Horticultural Research Station, Scoresby. Tomato field day.** —*J. Dep. Agric. Vict.*, xlvi, 5, pp. 207–208, 1 fig., 1948.

In this note it is stated that hybridization between the tomato varieties San Marzano and Burwood Prize has produced a new variety which appears to be immune from blossom-end rot [*R.A.M.*, xxii, p. 238; xxiv, p. 252].

Gäumann (E.) & Jaag (O.). **Die physiologischen Grundlagen des parasitogenen Welkens. II, III.** [The physiological bases of parasitogenic wilting. II, III.]—*Ber. schweiz. bot. Ges.*, lvii, pp. 132–148, 227–241, 2 pl., 3 figs., 14 graphs, 1947. [French summaries.]

Clavacin, also known as patulin, claviformin, expansin, and tercinin, was found to exert on detached tomato shoots a toxic action quantitatively comparable to that already described for lycomarasmin, the wilting substance secreted by *Fusarium* [*bulbigenum* var.] *lycopersici* [*R.A.M.*, xxvi, p. 361], but qualitatively of a rather different order. Whereas lycomarasmin operates primarily in the leaf-blade cells the toxic principle of clavacin is exerted mainly in the wood parenchyma, the phloem, and the cortical tissues of the stem and petioles. The mechanism of toxicity, too, largely corresponds in clavacin and lycomarasmin. Concentrations of 10^{-2} and 10^{-3} mol. of the former substance destroys simultanously the semi-permeability of the plasma membranes and the water-retaining properties of the protoplasts, thereby inducing wilt and loss of moisture, both pathological, whereas at 10^{-4} and 10^{-5} mol. only the water-retaining power of the protoplast is damaged, and consequently pathologic water loss is the sole result.

Spontaneous physiological wilting due to lack of water immediately affects the entire shoot, whereas toxigenic wilting begins with local effects which gradually advance. These consist, in the case of clavacin, of grooving and discoloration of the stems and petioles, drooping above the nodes, darkening of the leaf veins, and bleaching of the tissues along them. The wilt induced by lycomarasmin presents a different picture. The stems and petioles at first remain turgescent, but foliar

symptoms appear at the tip, margin, or in the veinal areas and proceed until all the leaflets are wilted, shrivelled, and brittle.

Quantitative differences further exist between physiological and toxigenic wilting in respect of the situation of the wilting threshold. In the tomato plants used in these experiments physiological wilting invariably developed with a water deficit of roughly 10 per cent., at which point it is fully reversible; with rising losses, however, the gravity of the damage increases, becoming irreversible for the basal leaves at 20 and for the whole plant at 40 per cent. In the case of toxigenic wilting on the other hand, the threshold does not depend primarily on the water deficit but on the concentration of the toxin; thus, at lycomarasmin concentrations of 10^{-2} and 10^{-3} mol. complete wilting only occurs with water deficits of some 20 per cent. When the lycomarasmin concentration reaches 10^{-5} mol. the water deficit may rise to 50 per cent., but it is unaccompanied by wilting.

The different situation of the wilting threshold in the spontaneous and toxigenic forms of the disturbance suggests that the wilting effect due to the destruction of the semi-permeability of the plasma membranes is counteracted by a stiffening action which enhances the rigidity of the green tissue and may operate in the manner of a coagulase.

The restriction of transpiration in a practically moisture-saturated atmosphere does not interfere with toxigenic wilting induced by clavacin, showing that there is no etiological connexion between the latter process and water loss. In these experiments light, as already observed in the case of lycomarasmin, played a decisive part in the development of the wilt symptoms at 10^{-3} mol. clavacin.

HUTTON (E. M.), MILLS (MARGARET), & GILES (J. E.). **Fusarium wilt of Tomato in Australia. 2. Inheritance of field immunity to Fusarium wilt in the Tomato (Lycopersicon esculentum).**—*J. Coun. sci. industr. Res. Aust.*, xx, 4, pp. 468–474, 1947.

In studies of the inheritance of field immunity in tomatoes to *Fusarium bulbigenum* var. *lycopersici* in Australia [*R.A.M.*, xxvi, p. 472], five-weeks-old seedlings were inoculated by dipping the roots in a water suspension of macerated mycelium and spores, planted in pots in the greenhouse, and 28 days later were rated 0 to 10 on the extent of vascular browning (internal rating). The average internal ratings of Bonny Best and Pan America were 8·1 and 0·76, respectively. Bonny Best and hybrids of similar susceptibility were rated from 3 to 10 and were classed as susceptible. Vascular browning did not extend above ground level in most Pan America plants, which were rated 0 to 2. Pan America and plants of hybrid progenies given this rating do not wilt if left growing in the greenhouse and, accordingly, are classed as possessing field immunity.

Most of the hybrid progenies from crosses between susceptible parents were field susceptible. Most of the field-immune segregates that did occur were from a Pearson 29–17 cross, indicating that if sufficient breeding work were done with this parent, field-immune hybrids of good agronomic quality might be produced.

In the F_1 of crosses between a field-immune and a susceptible parent field immunity was completely dominant over susceptibility. In subsequent generations there was a high preponderance of field-immune plants, and a high proportion of agronomic field selections with immunity. For example, in the Rouge de Mormande (R.D.M.) × Pan America cross, 564 progeny from 17 F_3 lines field-selected for agronomic quality were immune against 104 susceptible. Greenhouse inoculation showed that eight lines were homozygous and seven heterozygous for field immunity, one heterozygous and one homozygous for susceptibility. The inheritance pattern of field immunity was maintained throughout the different generations of the R.D.M. × Pan America cross and similar crosses. That its basis was sound was demonstrated by the fact that field-immune hybrids obtained by

this method remained unaffected when field infection of susceptible varieties was widespread.

In work with multiple crosses including one or two field-immune parents the cross containing both 42–50–6 (an F_4 selection of Marglobe × *L. pimpinellifolium* from Dr. B. L. Wade) and Pan America gave the greatest numbers of resistant progeny.

In the field the best immune hybrids gave higher yields than Pearson 29–17, but the differences were insignificant. The hybrids 5A–3–1, 5A–4–1 (both from R.D.M. × 42–50 (Wade)), and 12A–7–1 (R.D.M. × Pan America) were still segregating susceptible plants, whereas the other hybrids were almost fixed for field immunity, though showing segregation for agronomic type. Pan America was generally the best for vitamin C content which appears to be heritable.

The chief result of this work is the relative ease with which the combination of field immunity and good agronomic quality can be achieved by the use of Pan America preferably as pollen parent. Although simple crosses have been used predominantly, it is suggested that multiple crosses have a greater likelihood of both improving the tomato agronomically and introducing immunity from wilt. In such crosses, in order to incorporate the wilt immunity into a sufficient proportion of segregates, Pan America should occur in at least two places. Where field immunity is being thus introduced agronomic field selection should be followed by a test of field immunity using the greenhouse technique described. It is inadvisable to rely on selection for immunity under conditions of field infection, as the development of the disease in plants growing in the field is greatly affected by environmental conditions.

Nattrass (R. M.) & Ciccarone (A.). **Monochaetia canker of Cupressus in Kenya.** —*Emp. For. Rev.*, xxvi, 2, pp. 289–290, 12 figs., 1947.

Referring to the woody canker disease of *Cupressus macrocarpa* caused in Kenya by *Monochaetia unicornis* [*R.A.M.*, xxvii, p. 312], the affected tissues being subsequently invaded by *Pestalotia funerea* [ibid., xxvi, p. 555], and mentioning the resemblance of the disease to that in California caused by *Coryneum cardinale* [ibid., xxiv, p. 39], the authors state that W. W. Wagener records (*in litt.*) that on a cankered specimen of *Cupressus sempervirens* collected in Texas in 1933 by Dr. W. H. Long he found a species of *Monochaetia*. The label stated 'Spores six-celled, the four medium brown and the two end cells hyaline. Single seta at apex 5·5 to 7·5 μ long and bent at an angle at junction with spore. Spores 6·5 to 8 by 20 to 21·5 μ.'

M. unicornis was described as *Pestalozzia unicornis* by Cooke and Ellis in 1878, being first recorded on *Chamaecyparis thyoides* from New Jersey. The conidial measurements were given as 35 by 8 μ. Those of the Kenya fungus are 22·5 to 30 by 6 to 8 μ, the apical seta up to 10 μ (average 5·5 μ). The authors found that in the Kenya fungus the apical seta varies greatly in length and is sometimes absent, although this loss is not maintained in subsequent cultures or inoculations. The pedicel also varies and is only slightly thicker than the seta, with which it may be confused.

The symptoms of the disease in Kenya closely resemble those in California. The course of infection follows in almost every detail that described by Wagener for *Coryneum cardinale*. Many of the cultural and other characteristics of the two fungi follow the same general lines. Wagener also reports finding an associated saprophytic strain.

Numerous isolations and inoculations have confirmed that *M. unicornis* in Kenya is an active wound parasite, the evidence indicating that infection takes place only through wounds, though the fungus may, possibly, effect entry at the junction of a branch. Under certain conditions, it appears that the young foliage

may become infected in the absence of wounds, though this does not appear to be the case with *C. cardinale* in California.

Though *Cupressus lusitanica* and *C. arizonica* are only moderately susceptible to *Coryneum cardinale* in California, both, in Kenya conditions, are about as susceptible to *M. unicornis* as *Cupressus macrocarpa*. From the evidence so far obtained it appears that, on the whole, the latter parasite is more virulent than the former. It affects the bark and cambium and penetrates deeply into the wood. Young twigs in moist chambers are infected by inoculation, in contrast to Wagener's experience with *C. cardinale*. The weekly increment in canker length from inoculations at Nairobi was 0·5 to 1·4 cm. As far as is known to the authors no species of *Monochaetia* has previously been reported from Africa.

Larch canker.—*Leafl. For. Comm., Lond.*, 16, 5 pp., 4 figs., revised 1948. 2*d*.

The leaflet describing the symptoms, causal organism, and preventive treatment of larch canker (*Dasyscypha wilkommii*) [*R.A.M.*, xix, p. 506; xxiii, p. 50] is a revision of one that appeared originally in 1927 [ibid., vii, p. 130].

Uschdraweit (H. A.). **Die Bekämpfung der Wanzen-Kräuselkrankheit der Futter- und Zuckerrübe.** [The control of the bug-crinkle disease of the Fodder and Sugar Beet.]—*NachrBl. dtsch. PflSchDienst*, N.F., i, 9, pp. 134–137, 1948.

A description is given of the beet crinkle disease and its transmission by means of *Piesma quadratum* in Germany [*R.A.M.*, xxii, p. 508]. Since the institution, from 1936 to 1938, of an energetic campaign for the extermination of the vector by means of traps, the heavy losses of earlier years are scarcely to be feared. Constant vigilance, however, is still indicated, as shown by the fact that even in the dry season of 1947, 30 to 50 per cent. increases in yield were obtained by trapping in the heavily infested areas of Saxony and former Silesian territory.

Andrén (F.). **Ett betningsförsök mot rotbrand på Betor.** [A disinfection experiment against Beet damping-off.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1947*, 6, pp. 87–88, 1947.

A Dutch preparation, aabeta (600 gm. per kg. seed), proved to be the most effective of four fungicides tested against damping-off in sugar-beet at the Plant Protection Institute, Stockholm. It increased germinability by 23·2, yields by 25, and the proportion of healthy plants by 75·9 per cent., while reducing the incidence of infection from 100 to 14·2 per cent. U.T. 1875 b (600 gm.) gave slightly better control of the disease (13·8 per cent.), but did not compare favourably in other respects with aabeta, to which aagrano and panogén were also inferior for the end in view.

Hubbeling (N.). **Vatbaarheid van Stamslaboonenrassen voor ziekten welke met het zaaizaad overgaan.** [Susceptibility of dwarf French Bean varieties to seed-borne diseases.]—*Meded. Inst. Veredel. Tuinbouwgew. Wageningen* 1, 9 pp., 1946. [English summary. Received May, 1948.]

The results of several years' field studies in Holland on the reactions of different dwarf French bean [*Phaseolus vulgaris*] varieties to common mosaic [bean mosaic virus], halo blight (*Pseudomonas medicaginis* var. *phaseolicola*), anthracnose (*Colletotrichum lindemuthianum*), and *Ascochyta* spot (*A. boltshauseri* and *A. phaseolorum*) [*R.A.M.*, xxvi, pp. 276, 277] led to their groupings as follows in respect of the first three diseases. Virtually immune from mosaic are U.S. 5 Refugee, Idaho Refugee, and Corbett Refugee; from halo blight, Dubbele Witte and Dubbele Witte Stringless, Groninger Weekschil, Perfect Stringless, Roem van Holland, and Conserva Stringless; and from anthracnose, Dubbele Witte Stringless and Groninger Weekschil.

Slight susceptibility to mosaic was shown by Resistentia Stringless, Chocoladebruine, and Parijsche Markt; to halo blight by Vroege Wagenaar, Vroege Wagenaar Stringless, Saxa Stringless, and Chocoladebruine Stringless; and to anthracnose by Roem van Holland, Vroege Wagenaar, and Saxa Stringless.

Alpha Stringless, Conserva Stringless, Bonte Reuzen Stringless, Vroege Wagenaar, Vroege Wagenaar Stringless, Saxa Stringless, and Vroege Dubbele were fairly susceptible to mosaic; Alpha Stringless, Bonte Reuzen Stringless, and U.S. 5 Refugee to halo blight; and Dubbele Witte, Alpha Stringless, Conserva Stringless, Resistentia Stringless, Delicata Stringless, Chocoladebruine, U.S. 5 Refugee, and Vroege Dubbele to anthracnose.

Susceptible to mosaic were Dubbele Witte, Dubbele Witte Stringless, and Groninger Weekschil; and to halo blight Resistentia Stringless, Parijsche Markt, and Vroege Dubbele. The varieties listed as fairly susceptible to anthracnose sometimes contracted a more severe type of infection. A high degree of susceptibility to mosaic was shown by Perfect Stringless, Roem van Holland, Delicata, and most of the haricots; to halo blight by certain varieties of wax and field beans; and to anthracnose by Bonte Reuzen Stringless, various wax and field types, Noordster, and Eerster Pluk.

The early maturing varieties did not suffer to any extent from *Ascochyta* leafspot.

The mosaic symptoms were observed to differ with the reactions of the several varieties, being typical in the slightly susceptible class and similar to those of yellow mosaic in the fairly susceptible, while high susceptibility is accompanied by diverse malformations of the leaves and pods, known as 'steengrauw' [stone-grey]. Mention is made of the tendency to masking of mosaic symptoms both by moderately high and fairly low temperatures, as well as by cultivation in subdued light.

Temperature and atmospheric humidity are important factors in the expression of the symptoms of halo blight, as shown by Goss in the United States [ibid., xix, p. 451], and the same is true of anthracnose.

Reitsma (J.) & Van Hoof (H. A.). **Voorlopige mededeling omtrent een bacterieziekte in Cassave.** [Preliminary note on a bacterial disease of Cassava.]—*Landbouw*, xx, 2, pp. 94–96, 5 figs., 1948. [English summary.]

A die-back of adult cassava plants, affecting about 100 varieties in the Moeara experimental garden, near Buitenzorg, Java, was first observed in December, 1947, and is apparently of bacterial origin [cf. *R.A.M.*, xxv, p. 103]. Primary infection originates at the leaf tip or along the margins, the freshly attacked tissues presenting a dirty green, water-soaked aspect and being separated from the healthy portion by an irregular, dark green zone. The infection spreads rapidly, the diseased areas of the leaf turning first reddish- and then light brown and finally shrivelling. Meanwhile the organism passes through the veins into the petiole, thereby causing wilting of the entire leaf, which drops soon after the stem is invaded. In the stem the bacterium moves both upwards and downwards, penetrating the stalks of healthy leaves which consequently wilt and fall. It was isolated on several occasions from areas up to 40 in. from the point of infection. Young shoots produced on cuttings from diseased stems rapidly contract infection and succumb. The use of such cuttings for propagation should be avoided, since the disease is readily transmitted by this means to uninfected localities. The Mangi, R. 366, and P 988 varieties have shown a high degree of resistance to the die-back, whereas Valenca, Moeara, Basiorao, and Betawi are very susceptible. Further studies on the disease are in progress.

Volcani (Z.) & Dowson (W. J.). **A plant disease caused by a spore-forming bacterium under natural conditions.**—*Nature, Lond.*, clxi, 4103, p. 980, 2 figs., 1948.

A prevalent fruit spot of green peppers (*Capsicum annuum*) caused by *Bacillus polymyxa* [cf. *R.A.M.*, xxv, p. 356; xxvi, p. 48] was recently investigated by Z. Volcani in Palestine. The maturing fruits bore one to five light brown to grey, soft or firm spots, 8 to 12 mm. in diameter, the underlying, softened tissues containing bacteria, which were isolated in pure culture and produced subterminal spores. When drops of aqueous culture suspensions were deposited on the surface of pepper fruits, which were then wounded by needle pricks and placed under bell-jars at 28° to 30° C., lesions developed resembling those observed in nature. The organism was re-isolated and the experiment repeated, with similar results. Various vegetables inoculated with the organism under laboratory conditions developed a typical soft rot of the parenchyma, but no infection of pepper plants resulted from spraying with a suspension of the bacteria or from wound inoculations into leaves.

It appears that under natural conditions involving high humidity and a relatively high temperature, *B. polymyxa* is a wound parasite able to disintegrate the parenchyma of *Capsicum* fruits by means of its pectic enzymes.

Pucci (A.). **Una grave alternariosis sobre Pimiento y Berenjena en la República Argentina.** [A serious alternariosis on Chilli and Eggplant in the Argentine Republic.]—*Publ. tec. Direcc. agropec., B. Aires*, iv, 2, 7 pp., 2 pl., 1947.

Plantings of chilli and eggplant in the vicinity of La Plata, Argentina, were severely attacked by a species of *Alternaria* which formed ashen-grey lesions on the leaves and stems and yellow-brown to black ones (scabbed in the case of eggplant) on the fruits. The pathogen was determined by M. J. de Urriés as identical with specimens from Unamuno's herbarium of *A. tenuis* f. *genuina*, responsible for a similar disease of chilli in Spain [*R.A.M.*, xii, p. 354]. Control should be based on the destruction of infected fruits, crop rotation, weekly applications of 0·75 Bordeaux mixture, and cultivation of the resistant *Capsicum annuum* var. *longum*.

Săvulescu (T.) & Hulea (Ana). **Deux espèces d'Alternaria voisines, à pathogénie différente.** [Two related species of *Alternaria* differing in pathogenicity.] —*Bull. Sect. sci. Acad. roum.*, xxix, 2, pp. 134–138, 2 figs., [1947].

After referring to the report of *Alternaria capsici-annui* causing a yellowish, later blackish grey spotting of chilli pepper fruits in Rumania in 1932 [*R.A.M.*, xiv, p. 215] and to Bremer's report of a similar disease of the same host in Turkey, associated with *A. longipes* [ibid., xxiv, p. 440], the authors state that a comparison of the descriptions of the two fungi and a study of Rumanian herbarium material showed a number of differences. In *A. longipes* the conidiophores do not exceed 4 μ in diameter, whereas in *A. capsici-annui* the narrowest are 4·2 to 5 μ. In *A. longipes* the conidial beak is of a uniform colour and is uni- to triseptate, whereas in *A. capsici-annui* it is unilocular and becomes paler at the extremity. The conidia of *A. longipes* measure 30 to 50 by 10 to 13 μ, and those of *A. capsici-annui* 33 to 82 by 7 to 21 μ. The conidial measurements, however, are not sufficient to differentiate the two species, since according to Tisdale and Wadkins [ibid., x, p. 763] those of *A. longipes* vary with the culture medium, being 30 to 86 by 11 to 13 μ on tobacco leaves and 25 to 52·6 by 6·5 to 13 μ on potato dextrose agar. In *A. capsici-annui*, however, there are up to three longitudinal septa and only one or two in *A. longipes*.

An important biological difference is that Bremer's fungus would not infect tobacco or chilli leaves, while inoculations of chilli fruits succeeded only if the

fruits had been wounded. Therefore the fungus cannot be *A. longipes*, a view confirmed by Tisdale and Wadkins's statement that *A. longipes* is specific to tobacco, and in the authors' opinion it is *A. capsici-annui*.

Milbrath (D. G.). **Control of western Celery mosaic.**—*Bull. Dep. Agric. Calif.*, xxxvii, 1, pp. 3–7, 1 fig., 1948.

Western celery mosaic [celery mosaic virus: *R.A.M.*, xxii, p. 12; xxvi, p. 530] first aroused attention in the Venice–Sawtell area of Los Angeles County, California, in 1930. During the following three years, the disease became generally destructive in this locality and appeared in other parts of the county. The author thereupon advised that the force of the mass of infective virus should be broken by depriving the virus of its favourite host, celery, during a certain period each year. Carrots (also a natural host) grown only in small quantities were regarded as a negligible factor.

The bases of the recommendation were the following. The evidence indicated that the disease was not seed-borne and as all seedlings were grown in glasshouses, if any became infected the origin of the infection would be from outside. The sources of infective material in the field were confined to actively growing celery and celeriac. Commercial celery was grown all the year round and was a constant source of infective material. Aphids were suspected of transmitting the virus but were too numerous for their control to be regarded as feasible. As the symptoms differed from those of other types of mosaic on celery, a different method of control appeared justifiable.

In 1936 the Director of Agriculture was able to proclaim a host-free period or a host-free district, or both. At present, the host-free period outdoors is from 6th September to 1st December and in glasshouses from 6th September to 5th October.

In 1930, the celery acreage locally was 700 and the yield per acre 1,026 half crates. In 1931, the corresponding figures were 1,100 and 740, in 1932, 1,500 and 661, and in 1934 (when the disease reached its peak) 900 and 311. After that, yields doubled and trebled, reaching 1,000 half-crates per acre in 1946, and 1,400 in 1947.

Celery prepared for table use has not been prohibited from entry into the control area. It may be infected with virus but for the latter to spread aphid vectors would be necessary. In view of the washing of celery in the packing house and the icing applied in transit, however, appreciable numbers of aphids would not be expected to survive. Further, the possibility of an escaped aphid transmitting the virus of western mosaic is regarded as remote, as aphids carry the infective virus mechanically on the outer mouth-parts and retain it only with difficulty.

Crall (J. M.). **Defoliation of Soybeans in southeast Missouri caused by Phyllosticta glycineum.**—*Plant Dis. Reptr*, xxxii, 5, pp. 184–186, 1948. [Mimeographed.]

In August, 1947, the author found 33 per cent. of the inspected soy-bean fields in southeast Missouri affected by a leaf spot caused by *Phyllosticta glycineum* [*R.A.M.*, vi, p. 754], resulting in considerable defoliation. The infection rate varied from very slight to 100 per cent. The locally widely grown Ogden and Arksoy (Ralsoy) were both susceptible.

The small spots were round to oval, light to dark brown with darker margins, and at later stages the necrotic tissue often dropped out. The larger spots (over 5 mm. in diameter) were conspicuously olivaceous, apparently owing to the spores and hyphae of a secondary invader, a species of *Alternaria*. The spots enlarged, spreading over the entire blade, and ultimately the whole leaf was killed. In such severe

cases the fungus also invaded and killed the stipules and the leaf scar developed a characteristic dark brown lesion extending sometimes up to 1 cm. along the stem. Severely infected plants showed only a few living severely spotted leaves at the top. Numerous pycnidia of *P. glycineum* were found in the leaf tissue of the leaf spots and on the stipules, but rarely on the pedicels and stems. The globose to slightly applanate pycnidia measured 65 to 150μ in diameter, and the oblong to narrowly ellipsoid spores with rounded ends 1·8 to 3·2 by 5·2 to 7 (average 2·6 by 6·3)μ. The species differs from *P. sojaecola* [*Pleosphaerulina sojaecola*: ibid., xxiv, p. 218] in having shorter and less distinctly guttulate spores.

TAKAHASHI (W. N.). **Crystallization of Squash mosaic virus.**—*Amer. J. Bot.*, xxxv, 4, pp. 243–245, 3 figs., 1948.

The squash mosaic virus [cucumber mosaic virus: *R.A.M.*, xxvi, p. 478] was purified and concentrated by alcohol precipitation and high-speed centrifugation. Electron micrographs of a purified preparation showed that the relatively uniform, spherical virus particles tend to form aggregates of a rather uniform internal structure. Crystals of the virus have blunt ends, are isotropic when examined between crossed Nicols, and measure 0·5 to 0·8 by 3 to 5μ.

FENNELL (J. L.). **Inheritance studies with the tropical Grape.**—*J. Hered.*, xxxix, 2, pp. 54–64, 10 figs., 1948.

In this review of twelve years' genetic, physiological, and pathological observations on a group of wild tropical species of grapes, the author states that rust (*Physopella* [*Phakopsora*] *vitis*) [*R.A.M.*, xxi, p. 324] is one of the most destructive vine diseases of the American tropics. At the author's institute at Turrialba, Costa Rica, where some leaves persist on the vines throughout the year, the fungus remains almost perpetually in the uredo stage. Varieties derived mostly from *Vitis labrusca*, *V. vinifera*, *V. aestivialis*, or almost any temperate species were found most susceptible, though in the tropical group, *V. tiliaefolia*, *V. simpsoni*, and *V. shuttleworthii* were almost consistently immune from it. Breeding experiments showed that the first two species [of the latter group] transmit resistance as a dominant to mature progeny, resistance being controlled by relatively few genes. When *V. tiliaefolia* was hybridized with *V. vinifera*, which appears to be homozygous for susceptibility, all the resistant mature F_1 progeny were virtually immune. When these rust-free F_1 plants were again crossed with moderately susceptible species, 24 of a total population of 38 remained relatively free from the fungus in mature specimens. From a population of 28 F_1 progeny of *V. simpsoni* × *V. rufotomentosa* and × *V. shuttleworthii*, all mature plants displayed virtual immunity. When the muscadine vines, *V. popenoei* and *V. munsoniana*, were crossed with *Euvitis* varieties homozygous for susceptibility, all the F_1 progeny were immune. *V. tiliaefolia* and *V. simpsoni* are of value to breeders as a source of high resistance; the slightly weaker resistance of *V. shuttleworthii* appears to be conditioned by multiple factors. In crosses between this species and very susceptible varieties of *V. labrusca*, *V. vinifera*, and *V. aestivalis* all the F_1 progeny were susceptible to varying degrees.

Plasmopara viticola [cf. ibid., xxii, p. 420] can be as destructive in the tropics as in temperate regions. No known species of true bunch grape (*Euvitis*) is quite immune. The nearest approach to immunity can probably be found in some types of the *aestivales* series, as in forms of *V. rufotomentosa*. The author's studies indicate that widely different factors are present within the genus which may contribute to an over-all resistance when combined in a single hybrid. Resistance is expressed in two distinct stages, (*a*) in newly developed tissue, (*b*) in mature tissue. Both are equally important. When mature plants of *V. shuttleworthii* grew intertwined

with those of Feber Szagos and Cabernet Sauvignon (*V. vinifera*), young leaves and flower buds of the first species were severely attacked, while those of the two *V. vinifera* varieties in a comparable growth stage were unaffected: later, when all the leaves were mature, the reverse obtained. When these kinds, resistant and susceptible in different ways, were crossed, selections were obtained with better resistance than either parent or parent species. Resistance in stage (*a*) appeared to be inherited mostly as a dominant, while in stage (*b*) complex quantitative factors appeared to be involved, inheritance being, in part at least, recessive. Further, when *V. shuttleworthii* was hybridized with *V. munsoniana*, the factors of resistance in both stages (*a*) and (*b*) possessed by the muscadine staminate parent were completely dominant.

Resistance to *Elsinoe ampelina* [ibid., xxi, pp. 319, 480] is conditioned by multiple factors. The evidence obtained indicated that not more than two, or possibly three, major factors condition susceptibility. Usually, susceptibility was dominant, with resistance transmitted as a recessive segregating in the second and later generations. Most wild tropical species show moderate to good resistance, but when crossed with the highly susceptible *V. vinifera*, susceptibility of the latter was in all cases transmitted as a dominant to the F_1 progeny.

Leaf-spot diseases (*Alternaria* and *Cercospora* spp.) are very destructive to some vine species when grown in tropical America. The temperate North American species, *V. labrusca*, *V. aestivalis*, and *V. lincecumii*, and most of those native to the drier southwest regions were severely attacked at the author's station, as in some humid sections of the southern United States. When these susceptible species were crossed with *V. tiliaefolia* and *V. shuttleworthii* or with some forms of *V. vinifera*, hybrids with satisfactory resistance were obtained. As most tropical species show good resistance, leaf spot was not of major importance in the author's work.

Guignardia bidwellii [ibid., xxvi, p. 142] has not as yet presented a problem as regards tropical vine species. *Glomerella cingulata* [ibid., xx, p. 563] and *Melanconium fuligineum* [ibid., xxvii, p. 221] did not seriously affect the best selections. The author's observations suggest that these two forms of rot prefer fruit with a high acid content and a low percentage of sugar.

Uncinula necator [ibid., xxv, p. 330] was universally present, but its ravages appeared to be confined to the Old World temperate varieties, and it was not a major hazard to tropical varieties or species.

Smith (K. M.). **Plant viruses.**—ix+78 pp., 8 pl., 2 figs., 1 diag., 1 chart, London, Methuen & Co., Ltd., 1948. 6*s*.

The text of this second and revised edition of this excellent little book [*R.A.M.*, xv, p. 107] has been entirely re-written. The work now comprises eight chapters, an introductory one followed by others dealing, respectively, with (2) symptomatology, local lesions, virus movements in the plant, metabolism and growth of affected plants, strains and immunity, (3) transmission, (4) insect vectors, (5) the viruses themselves, their isolation, size and shape, and chemical and physical properties, (6) serology of plant viruses and classification, (7) control, and (8) the nature of viruses. A list of 102 references is appended.

Moore (W. C.). **Report on fungus, bacterial and other diseases of crops in England and Wales for the years 1943–1946.**—*Bull. Minist. Agric., Lond.*, 139, vi+90 pp., 26 figs., 5 graphs, 6 maps, 1948. Published by H.M. Stationery Office. 2*s*. 6*d*. net.

Among the numerous interesting records in this report [cf. *R.A.M.*, xxiii, p. 88; and also xxvi, p. 406; xxvii, p. 78] the following may be mentioned.

In 1945, *Phoma* foot rot of flax [ibid., xxvi, p. 56], previously not known in England and Wales except in Pembrokeshire, was observed in three crops near Leeds. Comparison of the Yorkshire fungus with herbarium material of *Ascochyta linicola* [ibid., xi, p. 647; xxv, p. 526] revealed no apparent difference. In both nearly all the spores were unicellular and the fungus should be referred either to *Phoma* or *Diplodina*. The fungus normally associated with *Phoma* foot rot of flax in Northern Ireland and Pembrokeshire appears to be identical.

Isolations were made from random samples of rotted onion bulbs discarded during a storage test at Long Ashton by H. E. Croxall; 72 per cent. of the bulbs gave *Botrytis allii* [ibid., xxvi, p. 2], 26 per cent. *B. byssoidea* [ibid., xxv, p. 92], and 2 per cent. *Penicillium* sp.; *B. byssoidea* was also found in April, 1945, causing wilt in an autumn-sown onion field in Warwickshire.

Chocolate spot (*B. cinerea* and *B. fabae*) [ibid., xxiii, p. 467; xxvii, p. 56] of field and broad beans was late everywhere in 1943, above normal in western areas, and average or slight elsewhere. It started in May and by the end of June was severe in the south-west, where many fields were a total loss. Several hundred acres failed completely in the Bristol Province, and with rust (*Uromyces fabae*) and potassium deficiency the crop loss in Gloucestershire and Somerset was estimated at 60 per cent. Generally attacks were less severe on starved crops, where ventilation was better, and no consistent relation was noted between severity of attack and soil potash and phosphorus content.

Gibberella moricola [ibid., xi, p. 281] was found along with *Phomopsis cinerescens* [ibid., xxiii, p. 33] and *Botrytis* sp. on a dead fig twig in Dorset in 1946. A *Leptosphaeria* again found on oat leaf sheaths in Hertfordshire in June, 1946, appeared to resemble *L. avenae* [ibid., ix, p. 625]; the non- to tri-septate ascospores, hyaline within the perithecium, honey-coloured in the mass outside, measured 14 to 18 by 2·5 to 4 (mostly 14 to 15 by 3) μ. *Peronospora galligena*, not previously recorded from Britain, was found at Slough (Buckinghamshire) in 1946 on *Alyssum saxatile* seedlings [ibid., xviii, p. 683]. *P. gei* [ibid., xxv, p. 579] was observed on *Geum* in Gloucestershire in June, 1945.

A species of *Phoma* was associated with a rot of eggplant fruit in Berkshire in September, 1945. The fungus, which was not unlike *Didymella lycopersici*, was shown by inoculation experiments to be strongly pathogenic to green and ripe tomato fruits. In January, 1944, rust (*Puccinia allii*) [ibid., xxvi, p. 325; xxvii, p. 114] was intercepted at Edinburgh in a consignment of garlic bulbs from Portugal.

Black wood vessel disease (*Pythium* sp.) was found scattered through seven acres of Yellow Globe and Red Intermediate mangolds on sandy soil in Surrey in August, 1945. A new British record for sainfoin [*Onobrychis sativa*] was the leaf spot due to *Septoria orobina* [cf. ibid., xxv, p. 166]. A slight attack of smut (*Sorosporium panici-miliacei*) [*Sphacelotheca destruens*: ibid., xxvii, p. 115] occurred in September 1944 on millet in Northamptonshire, apparently a new record for Great Britain.

New host records and other uncommon occurrences include *Alternaria solani* on eggplant, *Armillaria mellea* on the woody underground parts of tomatoes, killing a large bush of *Daphne mezereum*, and attacking *Olearia hastii* and other ornamentals, wheat grains infected by *B. cinerea*, Globe artichokes (*Cynara scolymus*) by *Bremia lactucae*, *Corynebacterium fascians* [ibid., xxv, pp. 68, 292] on wallflower, *Cylindrocladium scoparium* [ibid., xxiii, p. 305] on lupin roots, *Helminthosporium sativum* on rye, *Leptosphaeria nigrans* on wheat, *Myrothecium roridum* [ibid., xxv, p. 345; xxvii, p. 10] on potato, tomato, and lupin, *Plasmopara nivea* [ibid., xxiv, p. 388] on carrot, *Pythium ultimum* on cucumber, *Rosellinia necatrix* on *Pittosporum crassifilium*, *Uromyces genistae-tinctoriae* on laburnum, and *Zythia fragariae* [ibid., xxv, p. 125] on *Geum*.

VANDERWALLE (R.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1943.** [Observations and researches carried out at the State Phytopathological Station during the year 1943.]—*Bull. Inst. agron. Gembloux*, xiv, 1–4, pp. 65–76, 1945. [Flemish, English, and German summaries. Received June, 1948.]

In this report [cf. *R.A.M.*, xxvi, p. 324] it is stated that during 1943, oats in Belgium were attacked by *Leptosphaeria avenae* in its conidial stage, *Septoria avenae* [ibid., xxv, p. 155]. Certain flax varieties were heavily infected by *Phoma linicola* [ibid., xv, p. 776].

A brown leaf spot of *Laurus nobilis* growing under glass was caused by *Tetracytum lauri* n.sp. [ibid., xxv, p. 262]. On cherry, *Ascospora beijerinckii* [*Clasterosporium carpophilum*: ibid., xxvi, pp. 186, 187, 229] appeared to be more sporadic than the year before. *Keithia thuyana* [*Didymascella thujina*: ibid., xxv, p. 18] was found on *Thuja plicata*. *Phyllosticta napi* began to spread on crucifers.

VANDERWALLE (R.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1944.** [Observations and researches carried out at the State Phytopathological Station during the year 1944.]—*Bull. Inst. agron. Gembloux*, xiv, 1–4, pp. 77–86, 1945. [Flemish, English, and German summaries. Received June, 1948.]

In this report on plant diseases in Belgium in 1944 [see preceding abstract] it is stated that azaleas in glasshouses were attacked by *Septoria azaleae* [*R.A.M.*, xxv, p. 152]; the disease appeared to be getting worse, probably owing to unsatisfactory fertilizers and lack of heating. Spruce near Bruges showed infection by *Ascochyta piniperda* [ibid., xxvi, p. 223].

Rapport annuel pour l'exercice 1946. [Annual report for the year 1946.]—*Publ. Inst. nat. Étude agron. Congo belge 1947* (hors sér.), 184 pp., 1948. 70 fr.

In the section of this report (pp. 34–41) dealing with plant disease work in the Belgian Congo [cf. *R.A.M.*, xxvii, p. 122], R. L. STEYAERT states that oil palms at Kwango in 1945 were affected by three groups of diseases attacking, respectively, the spike, the trunk, and the roots [cf. ibid., xxvi, p. 235]. Spike diseases include *Pachybasium erectum*. Trunk diseases comprise tracheomycosis caused by *Fusarium* [a form of *F. oxysporum*] found by Wardlaw [ibid., xxvi, p. 103], *Marasmius palmivorus* [cf. ibid., xiv, p. 357], and a reddening of the deeper tissues, in the pith or the vascular system of the petiole, probably due to bacteria, and resembling the condition observed in 1942 (and since then) in the Lower Congo. Root disease in which the lateral roots disappear is very prevalent at Kwango. Growth of the root neo-formations quickly becomes arrested; the roots remain short (10 to 20 cm.) and the epidermis hardens, blackens, and finally dries up. The tree reacts by producing ascending rootlets from the central roots.

BURNETT (F.). **Report on agriculture in Malaya for the year 1946.**—85 pp., 1947.

In the section of this report [cf. *R.A.M.*, xxi, p. 66] dealing with plant diseases (pp. 52–54), it is stated that up to 1941 no serious disease of rice had been recorded in Malaya, but during the Japanese occupation blast (*Piricularia oryzae*) [ibid., xxvi, p. 466] was recorded for the first time. It is thought that the fungus was introduced by the Japanese on infected grains or on short-term Taiwan rice varieties, which appear to have been highly susceptible. The planting of these varieties has now ceased, but the disease has become established on some local varieties; those so far found susceptible are Nachin 11, Siam 29, and Serendah. Rice was also commonly affected by leaf spot (*Helminthosporium oryzae*) [*Ophiobolus miyabeanus*: ibid., xxvi, pp. 236, 316], the symptoms being sometimes

attributed at first to *P. oryzae*. The two diseases were, however, distinguishable, in that the spots caused by *O. miyabeanus* were smaller, round rather than oval, and had brownish centres, whereas the blast spots showed grey centres. The grains also were attacked by *O. miyabeanus*, black areas forming on the glumes. *Nigrospora sphaerica* [*N. oryzae*: cf. ibid., xxiii, p. 383] was commonly present on rice leaves, often in association with *O. miyabeanus*.

Tea red root (*Ganoderma pseudoferreum*) [ibid., xxiii, p. 290] was noted on one estate in Selangor and was very prevalent at Serdang, where, as a result of several years' neglect, it had killed numerous bushes. In some places the bushes had been killed in well-defined, roughly circular patches and in the centre of these there were stumps of *Albizzia moluccana* shade trees, from which the infection appeared to have spread. *Gliricidia maculata*, another shade tree, was also attacked, and young trees replanted in affected areas were almost invariably killed. One cacao tree at Serdang was killed by red root, infection probably having spread from *Gliricidia* in the vicinity. Tea seedlings showed brown blight with severe defoliation due to *Colletotrichum* [*?Guignardia*] *camelliae* [ibid., xxv, p. 474]. The older leaves of mature tea bushes were attacked by *Pestalozzia* [*Pestalotia*] *theae* [ibid., vi, p. 698; xxvi, p. 356].

The species of *Phomopsis* [ibid., xx, p. 7] first recorded in 1939 on rambutan [*Nephelium lappaceum*] again caused a disease of seedlings, invading the stems at about 2 in. from the ground, killing the bark, and causing wilting and death of the plants.

Chilli [*Capsicum annuum*] fruit rot was caused by *Vermicularia* [*Colletotrichum*] *capsici* [ibid., xvii, p. 346] and *C. nigrum* [ibid., xviii, pp. 57, 658], the former fungus also causing branch die-back. *C. nigrum* was more commonly found on rotting fruits. In one instance, almost every fruit on the affected bushes was rotted. In several localities chilli plants showed symptoms resembling those of mosaic [ibid., xxii, p. 275; xxiv, p. 175] and leaf curl [ibid., xxi, p. 342]; where these were severe the bushes were stunted and the fruits few and small.

Brinjal [eggplant] was affected by *Bacterium* [*Xanthomonas*] *solanacearum* [ibid., xxv, p. 536], practically all the young plants of some new importations from India being killed. Groundnuts were attacked by a species of *Rhizoctonia* which caused leaf rotting and stem die-back. *Rhizoctonia* leaf disease also affected beet, *Amaranthus gangeticus*, cluster bean [*Cyamopsis psoraloides*], and cucumber, being especially prevalent in wet weather.

Annual Report of the Department of Agriculture, Dominica, 1946.—30 pp., [? 1948].

The following notes on plant diseases occur on p. 12 of this report [cf. *R.A.M.*, xxvi, p. 145]. *Fusarium batatatis* var. *vanillae* continues to be the chief limiting factor in vanilla production in Dominica, though incidence was not abnormally high during the year. The control measures previously recommended [loc. cit.] should be continued. At Hillsborough Estate a high percentage of the tobacco plants were affected by mosaic.

Milbrath (D. G.). **Bureau of Plant Pathology.**—Ex *Rep. Dep. agric. Calif., 1947* (*Bull. Dep. Agric. Calif.*, xxxvi, 4), pp. 202–215, 1947.

In this report [cf. *R.A.M.*, xxvi, p. 529] it is stated that as a result of increasing losses among cruciferous plants in San Mateo County caused by the club-root organism, *Plasmodiophora brassicae* [ibid., xxvii, pp. 213, 355], a survey was made of 79 properties in this and neighbouring counties where these crops were grown on a commercial scale. In San Mateo 25 infested properties were found and two in the Colma area of San Francisco County. Strict sanitation measures in the seed-bed and the rigorous exclusion of seedlings from infested areas appear to be the best means of preventing the spread of the disease.

Further investigations were made into the incidence and dissemination of branch wilt (*Exosporina fawcetti*) of Persian walnut (*Juglans regia*) in California [ibid., xxvii, p. 102]. Scoutings made in areas south of the Tehachapi Mountains revealed the presence of the disease in Riverside County, in the vicinity of Riverside City, Moreno Valley, and near Hemet City. An examination of four nurseries in Sacramento Valley and three in Lower San Joaquin Valley, all situated near infected walnut orchards and for the most part in areas where the disease was first discovered, yielded no evidence of branch wilt from which it was concluded that nursery stock plays no part in the dissemination of the disease.

G. L. Stout and R. L. McClain report that in the course of the peach mosaic eradication campaign 729 new cases were found among 573,979 trees inspected, this being the lowest number encountered during the twelve years of the project. Newly infected properties numbered 49 with 85 mosaic trees distributed in Los Angeles, Riverside, and San Bernardino Counties.

There are now few known cases of vine mosaic [ibid., xxvi, p. 189] in Napa, Santa Clara, and San Joaquin Counties.

To check the effectiveness of the quick decline quarantine regulations in protecting healthy or lightly infected groves [ibid., xxvii, p. 96], and to determine the possible need for changing the quarantine boundaries to conform with the advance of the disease, a tree survey covering 93,340 acres was made in the lightly infected and uninfected regulated areas under quarantine and quarantined areas of San Bernardino, Riverside, Orange, and Los Angeles Counties. No infected trees were found in Riverside County or in several counties outside the quarantine area. In Orange County there were six diseased trees on one property north of the heavily infected area and five on three properties to the south-west of it. In western San Bernardino County 106 diseased trees were found on 13 properties, and in Los Angeles County 133 typical quick decline trees on 22 properties, two newly infected localities being located between the heavily infected areas of Riviera and Covina.

According to G. Ken Knight mortality among bearing date palms (*Phoenix dactylifera*) in the Coachella Valley was apparently due to the disease of unknown etiology known as rhizosis [ibid., xxi, p. 195] or rapid decline. Root rot appears to be a delayed and secondary symptom. The fruit on affected palms drops or shrivels, the leaves wilt, and heart rot is usually observed. Mortality commonly occurs in a few weeks following the appearance of the initial symptoms although offshoots usually survive. No varietal resistance has been observed. The disease has been present although of minor importance in the Valley for about 10 years and is most prevalent at the north-west extremity, decreasing in geometric proportion to the south-east. Rapid decline appears to attack palms singly, not in groups or rows; vigorous palms and those near the edge of the orchard appear to be most liable to attack.

The same author continuing the report on the *Omphalia* date root rot survey states that root samples were taken from 118 properties and *O. pigmentata* and *O. tralucida* were detected in 69. Weak palms have been charted in 411 properties involving 220,296 palms. *Omphalia* is most readily isolated from large rotten roots but is occasionally obtained from very small necrotic secondary or tertiary roots, and in a few cases from roots where no necrosis was noted. On the other hand, only about 20 per cent. of declined palms in infected orchards have yielded *Omphalia* with one sampling. Among the principal Iraqian varieties Khadrawy Zahidi and Halawy, and the Egyptian variety Saidy 20, 17, 33, and 14 per cent. diseased palms have been detected in addition to 9 per cent. for Deglet Noor. *Omphalia* spp. were found in 23 additional orchards in Coachella Valley, their known geographical distribution being extended by their discovery in two orchards in the Borego Valley (San Diego County) and five in the Imperial Valley.

G. E. Alstatt reports that as the result of a survey embracing 1,296 acres of cherry orchards mainly of the Bing variety, cherry blister was found in Santa Clara County where only leaf spot and blister symptoms were evident, and in Contra Costa County where it causes a severe dieback condition.

Fifty-eighth Annual Report of the University of Maryland Agricultural Experiment Station, 1944–1945.—36 pp., [(?) 1945. Received August, 1948.]

It is stated on p. 13 of this report [cf. *R.A.M.*, xxvii, p. 122, and next abstract] that during the period under review dipping the sprouts in spergon before transplanting reduced sweet potato wilt [*Fusarium bulbigenum* var. *batatas* and *F. oxysporum* f. 2: ibid., xxvii, p. 176] in greenhouse and field tests in Maryland from 10·4 per cent. in the untreated controls to 1·6 per cent., yield being increased from 258 to 436 lb. per plot. Fermate gave similar results, though semesan bel caused reduction in stand and yield.

The acreage under cultivated blackberries in western Maryland (p. 18) has greatly declined in recent years largely owing to the inability of growers to obtain pure stocks of the Eldorado variety free from crown gall [*Bacterium tumefaciens*: cf. ibid., xi, p. 423; xix, p. 716; xxv, p. 545]. Work designed to provide growers and nurserymen with a source of Eldorado plants true to name and free from disease was started several years ago. Selected individual Eldorado plants were propagated in sterile soil from leaf-bud cuttings to obtain freedom from gall and set out in new soil on the Maryland Plant Research Farm. The plants have all fruited satisfactorily and are completely free from crown gall. Plants for growers and nurserymen can now be propagated rapidly from this foundation stock.

Fifty-ninth Annual Report of the University of Maryland Agricultural Experiment Station, 1945–1946.—pp. 1–46, 8 figs., [(?) 1946. Received June, 1948.]

On pp. 15–16 of this report [see preceding abstract] it is stated that puratized N5E used as a sprout dip gave promising control of *Fusarium* wilt of sweet potatoes [*F. bulbigenum* var. *batatas* and *F. oxysporum* f. 2].

In extensive spraying and dusting trials, zerlate was outstanding in the control of anthracnose of tomatoes [*Colletotrichum phomoides*: *R.A.M.*, xxvii, p. 392] while tribasic copper sulphate and dithane-zinc-lime at 8 lb. per acre controlled fruit rots and defoliation diseases satisfactorily.

In tests of potato varieties Menominee [ibid., xxvii, pp. 86, 121] yielded well under Maryland conditions and should be valuable for use in soils infested with scab [*Actinomyces scabies*].

Annual Report of the Board of Control, Nevada Agricultural Experiment Station, for the fiscal year ending June 30th, 1947.—29 pp., 4 figs., 1948.

On p. 25 of this report it is stated that early loss of lucerne stands and subsequent decrease in hay yield in Nevada are largely due to bacterial wilt (*Corynebacterium insidiosum*) [*R.A.M.*, xxvii, p. 121]. Six years' varietal resistance tests with 30 different varieties demonstrated that in areas where the disease is serious Ranger and Buffalo are the best available varieties, the former being rather better than the latter. Orestan and Hardistan are also highly resistant, but the yields are rather less. In areas where the disease is only a minor factor in reducing hay production, Cossack, Grimm, Baltic, and Ladak are suitable. In some parts of western Nevada the stem nematode *Ditylenchus dipsaci* attacks lucerne and wherever it is found bacterial wilt is also present. The Nemastan variety is resistant to the nematode and moderately resistant to bacterial wilt, but is not a good hay producer. Efforts are being made to improve this variety, and promising results have already been obtained.

Björling (K.). **Stråbassjukdomar hos Vete och Korn.** [Straw base diseases of Wheat and Barley.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1948*, 2, pp. 24–27, 3 figs., 1948.

In the southern and central regions of Sweden, where cereals, especially wheat and barley, occupy an important position in the rotation, two foot rots are fairly often encountered, namely, take-all and whiteheads (*Ophiobolus graminis*) [*R.A.M.*, xiii, p. 297] and eyespot (*Cercosporella herpotrichoides*) [ibid., xxv, p. 96]. Their symptoms and modes of overwintering are briefly described. Of primary importance in the control of both diseases is the exclusion of the susceptible crops from the rotation for sufficiently lengthy periods—one to two years in the case of *O. graminis* and three to four in that of *C. herpotrichoides*.

Peturson (B.), Newton (Margaret), & Whiteside (A. G. O.). **Further studies on the effect of leaf rust on the yield, grade, and quality of Wheat.**—*Canad. J. Res.*, Sect. C, xxvi, 1, pp. 65–70, 1948.

Results of experiments carried out at Winnipeg in 1944–6 indicated that the effects of wheat leaf [brown] rust (*Puccinia triticina*) [*R.A.M.*, xxvi, pp. 8, 49] on kernel weight, bushel weight, and yield were more pronounced than those on quality and grade. Heavy infections ranging from 78 to 87 per cent. (Saunders and Thatcher) caused reductions of up to 27 per cent. in kernel weight, 3·5 lb. in bushel weight, and 40 per cent. in seed yield, while the products were usually reduced by one commercial grade. Lighter infection (22 per cent.) on Regent caused smaller but appreciable yield reductions but no grade reduction. Rust was effectively controlled in all three years by dusting with sulphur, only a trace of infection occurring even on the very susceptible varieties. Brown rust generally decreased the protein but modified it favourably as regards baking quality; it invariably increased the carotinoid content of the seed.

It is emphasized that the existing wheat varieties highly resistant to brown rust should be made available to growers as early as possible.

Tyner (L. E.). **Effect of crop debris, plant roots, and crop sequence on the microbial flora of the soil in relation to root rot in cereal crops.**—*Canad. J. Res.*, Sect. C, xxvi, 1, pp. 86–93, 6 graphs, 1948.

The decomposition of wheat, barley, and oat straw in soil caused a considerable increase in the populations of bacteria and actinomycetes in approximately equal amounts; the oat compost yielded significantly more fungus colonies than the others [*R.A.M.*, xix, p. 649.]

In another laboratory experiment, wheat, oats, barley, and beans were planted in various rotations in pots in soil originating from fields heavily infested with *Helminthosporium sativum*, *Ophiobolus graminis*, and *Fusarium* spp. Saprophytic fungi, mostly *Penicillium* spp., and *Mucor* spp. were up to 15 times more abundant from the rhizosphere of wheat roots than from those of the other plants, regardless of crop sequence. Presumably this increase is correlated with the larger amount of dead root tissue on this crop, as the wheat seedlings were more severely affected by disease than the other hosts. In fallow soil the rhizospheres of wheat, oats, barley, and beans yielded about the same numbers of fungi.

Tapke (V. F.). **Environment and the cereal smuts.**—*Bot. Rev.*, xiv, 6, pp. 359–412, 1948.

The author reviews and discusses with 227 references to the literature of the subject the question of the effect of environmental factors on cereal infection by the smuts [cf. *R.A.M.*, xxv, p. 256]. The diseases dealt with comprise barley covered smut (*Ustilago hordei*) [cf. ibid., iii, p. 448; xxv, p. 549] and false loose

smut (*U. nigra*) [cf. ibid., xxv, pp. 60, 256, 553], oat loose and covered smuts (*U. avenae* and *U. kolleri*) [cf. ibid., iv, p. 343], sorghum loose and covered kernel smuts (*Sphacelotheca cruenta* and *S. sorghi*) [cf. ibid., iv, p. 343; xvii, p. 453], wheat bunt (*Tilletia caries* and *T. foetida*) [cf. ibid., vii, p. 773; xviii, pp. 166, 167], maize and sorghum head smut (*S. reiliana*) [cf. ibid., v, p. 606; vi, p. 548], rye stripe smut (*Urocystis occulta*) [cf. ibid., xx, p. 569], wheat flag smut (*Urocystis tritici*) [cf. ibid., ii, p. 398], maize smut (*Ustilago maydis*) [cf. ibid., iv, p. 475], wheat and barley loose smuts (*Ustilago tritici* and *U. nuda*) [cf. ibid., xi, p. 165], and rice kernel smut (*T.* [*Neovossia*] *horrida*) [cf. ibid., xiii, p. 469]. The evidence adduced is considered to provide ample confirmation of the view expressed by the late Sir E. J. Butler that plant disease should be regarded as an interaction of host and parasite under the conditioning influence of environment.

Hulea (Ana). **Speciile de Tilletia care produc mălura Grâului.** [The species of *Tilletia* causing Wheat bunt.]—*Publ. Inst. Cerc. agron. României*, 99, 178 pp., 63 figs., 3 graphs, 2 maps, 1947. [French summary.]

Further studies on *Tilletia foetens* [*T. foetida*], *T. tritici* [*T. caries*], *T. triticoides*, and *T. intermedia* causing wheat bunt in Rumania [*R.A.M.*, xxii, p. 14; xxvii, p. 415] have shown that germination occurred most readily in agarized water or in soil and that the best mycelial growth is obtained on malt, oat, and potato agars. Although the use of aneurine did not influence the germination of chlamydospores of *T. caries*, it hastened the development of the basidia and mycelium.

Germination of the chlamydospores of *T. foetida*, *T. intermedia*, and *T. triticoides* occurred after three to four days and of *T. caries* only after 30 days. It was directly related to the surface aeration of the medium, the degree of humidity, the pH, which ranged from 4 to 10, and the temperature, the minimum being from 3 to 4° C., the optimum from 16 to 20°, and the maximum above 28°. In all four species the development of basidia, primary sterigmata, and basidiospores was identical. The *Tilletia* spp. are homothallic up to the formation of the secondary basidiospores and after that heterothallic.

Atkins (I. M.) & McFadden (E. S.). **Oat production in Texas.**—*Bull. Texas agric. Exp. Sta.* 691, 66 pp., 18 figs., 2 maps, 1947.

In the section of this bulletin dealing with oat diseases in Texas (pp. 27–38) it is stated that crown rust [*Puccinia coronata*: *R.A.M.*, xxvii, p. 15] is probably the most destructive, the average loss amounting to 2,192,600 bush. annually from 1931 to 1939, inclusive. Losses are now declining as a result of the increased acreage under the resistant varieties Fultex, Victorgrain, Stanton, Ranger, Rustler, Alber, Camellia, and Verde. The only feasible control method lies in the use of resistant varieties.

Stem [black] rust [*P. graminis*: ibid., xxvii, p. 126] is usually less destructive than crown rust on oats. With this disease also, the only means of control consists in developing resistant varieties. Except Verde, recommended for the Lower Rio Grande Valley and the Coastal Plains, all oat varieties commercially available in Texas are susceptible.

Against loose and covered smuts [*Ustilago avenae* and *U. kolleri*: loc. cit.] seed dusting with new improved ceresan is recommended or treatment with formalin.

With the distribution of new varieties resulting from crosses with Victoria, *Helminthosporium victoriae* [ibid., xxvii, p. 360] has increased to epidemic proportions, the varieties most seriously affected in Texas being those resistant to crown rust, Fultex, Victorgrain, Ranger, Rustler, and Verde. The evidence indicates that this disease is likely to prove more serious in warm, humid parts of the state than in drier areas. Seed-treatment with new improved ceresan is indicated. Red Rustproof strains are much more resistant than varieties derived from crosses

with Victoria. It is suggested that in southern Texas, Alber and Camellia may prove more resistant than Ranger and Rustler.

Cralley (E. M.). **Corn seed treatment.**—*Bull. Ark. agric. Exp. Sta.*, 466, 10 pp., 1947.

The results of maize seed treatment tests [*R.A.M.*, xxvii, p. 278] carried out from 1943 to 1946 at Stuttgart, Clarkedale, and Fayetteville, Arkansas, showed that hybrid seed treated with spergon, arasan, and semesan jr. yielded an average of 47·7, 45·4, and 43·8 bushels per acre, respectively, in comparison with untreated seed which yielded 41·3 bushels per acre while the stand counts averaged 48·5, 45·6, 45·4, and 44·0, respectively. Seed treatment was particularly beneficial when soil conditions at planting time were unfavourable for germination and optimum growth of the young seedlings. At Fayetteville, in 1946, significant increases in yield were obtained only with seed treatment at early and medium dates of sowing (April 19th and May 6th). The severity of seedling diseases of maize [unspecified] varies from year to year and seed treatment may therefore be of great value some years and not in others. As the cost of treatment is slight it is recommended that seed maize be treated each year as an insurance, in fact some seed producers are treating all seed before sale to dealers or farmers, a highly desirable practice.

South African Citrus industry menaced by black spot disease.—*Calif. Citrogr.*, xxxiii, 3, pp. 124–125, 1948.

Dr. V. Wager stated, in an interview reported in the *Durban Daily News*, that outbreaks of citrus black spot disease [*Phoma citricarpa*: *R.A.M.*, xxvi, p. 152] are spreading in dry areas where it was hitherto unknown, thus constituting a potential threat to the South African citrus industry.

Ruggieri (G.). **Fattori che condizionano o contribuiscono allo sviluppo del 'mal secco' degli Agrumi e metodi di lotta contro il medesimo.** [Factors which induce or contribute to the development of 'mal secco' of Citrus and methods of controlling it.]—*Ann. Sper. agr.*, N.S., ii, 2, pp. 255–305, 4 figs., 1948. [English summary.]

Citrus 'mal secco' disease (*Deuterophoma tracheiphila*) [*R.A.M.*, xxvii, pp. 70, 318], though rather widespread in Sicily when it first appeared, is now found only in those parts where the control measures are inadequate. In the districts which formerly suffered severely the disease has become progressively less injurious, less conspicuous, and almost 'tolerable' to the trees and the crop. As a result, some growers, believing in a gradual attenuation of the pathogenicity of the fungus, have begun to use the very susceptible Femminello lemon for grafting and even the susceptible bitter orange as a stock. The observed decline in 'mal secco' disease, however, is due largely to the use of resistant varieties, the extirpation of unsatisfactory groves, and improved cultural conditions.

Progress of the disease can be slow or rapid [ibid., xxv, p. 497]. If infection starts at a few points at the top of the tree and spreads through the leaves or the terminal branches, then advance is slow, but if the fungus happens to attack most of the green parts, then death rapidly ensues. The latter case is exceptional. In 'mal nero' [loc. cit.] progress is at first very slow, but becomes rapid after some years, when infection is spread with the ascending sap. In the rapid form, 'male fulminante', the symptoms are those of the second stage of 'mal nero', and these two forms of the disease should not be confused.

In Sicily, for the infection of susceptible varieties, atmospheric temperature must be between 14° and 28° C. and humidity between 65 and 90 per cent. Orchards most exposed to the wind are those most frequently infected. Spread has often been observed to take place much more slowly on compact argillaceous soil than

on other soil types. Susceptibility varies with the variety, locality, and with the age of the tree, older plants being less susceptible than young ones.

It was formerly the practice in the province of Messina to plant bitter orange seedlings in their permanent positions and graft them on the spot later. But during this period they readily became infected. It is therefore necessary to plant trees previously grafted in the nursery with resistant scions. In affected localities such planting out should be effected at the end of winter or beginning of spring or, if circumstances permit, during summer, when high temperatures are unfavourable to infection. Further, the susceptibility or resistance of a lemon variety may be appreciably affected by that of the stock on which it is grafted. The type of fertilizer used and the method of applying it also affect susceptibility [ibid., x, p. 594]. Moreover the disease is more severe in those citrus groves in which other herbaceous plants are regularly grown. The flowering of forced lemons for summer ripening [ibid., v, p. 359; xxv, p. 497] should be delayed, the fruits ripened between late spring and summer and picked early or as soon as conditions favour infection.

Control of the disease [cf. ibid., xviii, p. 245] by spraying would be very difficult on fully grown trees but the method should prove useful with nursery seedlings and during the first few years after planting out. For such cases, spraying with 1 per cent. Bordeaux mixture during the periods when the disease usually appears is recommended. From the first appearance of the disease in Sicily, sweet orange and mandarin (*C. nobilis* var. *deliciosa*) showed high resistance, but the former, in the very mild localities where lemons are grown, is generally very susceptible to attack by fruit fly (*Ceratitis capitata*), for which reason the author recommended the use of the fruit-fly resistant Ovale and Calabrese varieties. The planting of oranges in an area suitable for lemons is, however, only a temporary measure and has largely ceased with the increased cultivation of the resistant Monachello lemon [ibid., xvii, p. 520; xviii, p. 245]. Oranges should still be grown in infected lemon areas which are not suited to Monachello. The very early, resistant Interdonato lemon [ibid., xv, p. 360] is not recommended.

Calavan (E. C.) & White (F. A.). **Dry bark of Lemons prevalent in coastal areas on various rootstocks and found to extend inland.**—*Calif. Agric.*, ii, 7, pp. 13, 15, 1 fig., 1948.

The substance of this article has already been noticed from another source [*R.A.M.*, xxvii, p. 232].

Fawcett (H. S.) & Calavan (E. C.). **Wood pocket of Lemons.**—*Calif. Citrogr.*, xxxiii, 3, pp. 94, 126, 4 figs., 1948.

Wood pocket of lemons [*R.A.M.*, xxvii, p. 129] has now been detected at the Citrus Experiment Station, California, in 228 out of 237 trees of the semi-dense Lisbon strain, in which it was first noticed, all of which were descended from one tree from an orchard near Corona, California. Trees from the same source, but planted elsewhere, are also showing wood pocket.

Wood pocket symptoms appeared on the new growth from healthy scions of Lisbon lemon, Eureka lemon, and Dorshapo sweet lemon grafted on to diseased trees. The disease also developed in the progeny budded from diseased parent trees. Leaf symptoms appeared within four months on as many as 19 per cent. of the seedlings grown from seeds of diseased Lisbon lemon trees. The results of these experiments show that wood pocket is carried along in propagation from buds of diseased trees, and that the leaf symptom is transmitted to or reproduced in healthy lemon scions grafted on diseased trees indicating the presence of a virus or toxin in the latter. The results also indicate that the ability to produce leaf symptoms is transmitted from the seeds to at least a part of the seedlings. It is recommended that all propagation of trees from the semi-dense lemon strain

originating from the Corona orchard should be avoided and unless the disease is found not to be of virus origin, these trees should not be top-worked nor their rootstock growths used for seed purposes.

KLOTZ (L. J.). **Notes on Lemon diseases.**—*Calif. Citrogr.*, xxxiii, 3, pp. 112–115, 1948.

This is a survey of four diseases affecting lemon trees in California; shell bark [*R.A.M.*, xxvii, p. 183], dry bark [ibid., xxvii, p. 232], wood pocket [see preceding abstract], and collapse. Susceptibility to shell bark appears to be related to rootstock. Eureka on rough lemon is twice as susceptible as it is on C.E.S. grapefruit No. 343, six times as it is on Sampson tangelo, and nine times as it is on Duncan grapefruit. Symptoms which indicate that collapse may be due to a virus include a destruction of the food-conducting vessels, which is most serious at and above, but not below, the bud union, decreasing in severity towards the branches. At present less than 100 trees, all on grapefruit stock, are affected. Some affected trees apparently recover from the disease.

GUISCAFRE-ARRILLAGA (J.). **Sensitivity of Penicillium digitatum to 2,4-dichlorophenoxyacetic acid.**—*Plant Dis. Reptr*, xxxii, 6, pp. 248–250, 1948. [Mimeographed.]

At the Louisiana State University it was found that oranges dipped for three to five minutes in a 0·1 per cent. solution of 2,4-D (Dow 70 containing 70 per cent. 2,4-dichlorophenoxyacetic acid and 30 per cent. sodium bicarbonate, or Du Pont containing 75·9 per cent. acid equivalent) showed 0 to 8 per cent. decay [due principally to *Penicillium digitatum*: *R.A.M.*, xxvi, p. 148] in one week; those dipped in 0·2 to 0·3 per cent. solutions showed no decay in one week, and an average of 10 per cent. in three weeks; and the control 14 to 25 and 50 per cent. decay, respectively, for the same periods.

Considerable reductions in fruit decay (0 per cent. rot in the first, and an average of 16 per cent. in three weeks compared with over 50 per cent. in the control) were also obtained in tests in which 10 gm. Dow 70 were scattered at the bottom of a container and covered with a filter paper, or alternatively filter paper soaked with 10 c.c. of the ethyl ester, and the fruit placed over it. The taste of the fruit remained unaffected by these treatments.

In slide tests a spore suspension of the fungus (to which filtered and centrifuged orange juice had been added for better germination) was either placed on a dried smear of the chemical, or a drop of each was mixed on the slide. The slides were placed in moist chambers and spore-germination counts made after 24 hours. The results indicated that concentrations of 0·1 to 0·3 per cent. of 2,4-D strongly inhibited the germination of conidia of *P. digitatum*. The fumes of 2,4-D ethyl ester arrested the growth of the germ-tubes.

GARCÍA (L. A. A.). **Studies on Coffee root disease in Puerto Rico.**—*J. Agric. P.R.*, xxix, 1, pp. 1–29, 4 figs., 1945. [Spanish summary. Received May, 1948.]

Coffee crops in Puerto Rico are seriously damaged by black rot, generally attributed to *Rosellinia bunodes* [*R.A.M.*, viii, p. 442] although the pathogenicity of this fungus has never been demonstrated [ibid., xx, p. 564].

In the field the leaves of affected plants first show interveinal chlorosis which spreads gradually or rapidly; they then turn brown, die, and fall. The whole tree wilts and becomes dry, the lower part of the stem and the roots showing advanced cortical deterioration and blackening of the affected areas. When peeled the stems showed black vascular strands, running length- and cross-wise. Under greenhouse conditions coffee seedlings under one year old showed similar symptoms. Grown on a moderately wet substratum they developed wilt without much stem

rotting, and under a high relative humidity showed damping-off. The pathogen grew vigorously in the affected tissues and ascended to the leaves which were sometimes also invaded. The vascular elements, particularly the xylem vessels, were necrotic; some were enlarged, and others filled with an ochreous substance, but no mycelial penetration was observed.

A *Fusarium* sp. isolated by the author in 1939 from the innermost stem and root tissues of diseased plants is considered to be a new variety, *F. bulbigenum* var. *coffeae* n. var., and is the causal organism of black rot in Puerto Rico. A *Verticillium* sp. resembling *V. lycopersici* was also frequently isolated from the bark of infected trees and *F. solani* occurred as a contaminant.

These isolates as well as *R. bunodes* were tested for pathogenicity using Wellman's technique [ibid., xix, p. 170]. Coffee seedlings with one pair of leaves well opened were immersed in inoculum prepared by breaking up cultures in fresh sterile solution, and transplanted into sand cultures. On a substratum kept saturated 10 per cent. of seedlings inoculated with *F. bulbigenum* var. *coffeae* developed symptoms after 21 days, while on sand saturated only at planting the time was 10 days. None of the other isolates was pathogenic.

When coffee seedlings at the eight-leaf stage were placed for two days in (1) unboiled and (2) boiled filtrates of the pathogen, the leaves of the former showed wilting and chlorosis, while the latter remained healthy. High temperature (20° to 36° C.), high relative humidity, and low pH (4·5 to 6·5) were conducive to the development of the disease. Very dry and very wet conditions were unfavourable.

Of 28 coffee varieties tested for resistance on an acid substratum, Murta showed only 6 per cent. infection, Ceylon Hybrid and Dewevrei 20 per cent., and Puerto Rico and Columnaris 33 per cent. each. The last-named, however, appeared resistant in the field.

F. bulbigenum var. *coffeae* resembles *F. b.* var. *vanilla* but is not pathogenic to vanilla and nor is the vanilla variety pathogenic to coffee [ibid., vi, p. 599]. It has sickle-shaped, hyaline, pedicellate, usually tri-septate macroconidia, not constricted when young, measuring 16·75 to 45 by 3 to 3·7 μ. The number of septa varies from one to six. Non-septate, oval or ellipsoidal microconidia measure 6 to 12 by 2 to 3·5 μ. Terminal or intercalary chlamydospores are formed singly or in chains in old cultures. Oatmeal agar substratum becomes lilaceous, and potato dextrose agar reddish to vinaceous to bluish. The spores are formed in salmon-coloured masses, or on white or tinged sporodochia on potato dextrose and oatmeal agars and steamed rice cultures.

Small plots on infested land, treated with lime and sulphur at 500 gm. per sq. m., respectively, were free from the disease over a period of three years, while untreated plots had 5 per cent. infection. Plots treated with 150 gm. sulphur and 50 c.c. of a 5 per cent. solution of chloronaphtholeum per sq. m. had 3 per cent. of diseased trees. Chloronaphtholeum at 450 c.c. per sq. m. and copper sulphate solution sprayed at the rate of 20 gm. per sq. m. were also effective.

Progress Reports from Experiment Stations, season 1946–47.—152 pp., 7 graphs, 1 diag., London, Empire Cotton Growing Corporation, 1948.

In the report from Barberton, South Africa [cf. *R.A.M.*, xxvi, p. 450], D. MacDonald and H. E. King state that *Alternaria* [*A. macrospora* and *A. gossypina*] disease of cotton [ibid., xxvi, p. 243 and next abstract] is not common locally where the soil is typically granitic; most of the attacks have been confined to the loam soil of the Experiment Station. Young vigorously growing plants are not materially affected and symptoms appear only when the early bolls are approaching maturity. In many cases spread is very rapid and the crop may become completely defoliated in three weeks. Early heavy-fruiting plants are attacked first, while plants stripped of their bolls remain unaffected, i.e., a high boll to leaf

ratio favours the rapid development of the disease. A reduction of the ratio may retard or even prevent attack. The edge rows of a plot usually remain green long after the inside of the plot is defoliated, and in some cases they mature their total crop without showing any symptoms. Leaves taken from the manurial plots in 1941–2 [ibid., xxii, p. 304] were analysed at Rothamsted Experiment Station, and the results now available show that potash deficiency clearly predisposes the cotton plant to *Alternaria* attack.

G. M. Wickens reports that wilt disease (*Verticillium dahliae*) occurred for the first time on two farms in the district. He describes a randomized experiment carried out at Barberton to evaluate the relative reaction of six cotton varieties to natural infection by *V. dahliae* [cf. ibid., xxvi, p. 450]. The disease appeared very sporadically, but the results showed consistently that in areas of widely varying disease intensity U.4/5143, A.2106, M.U. 8A, and B.P. 50/3 were all equally susceptible and showed heavy (70 per cent. average) infection, B.P. 52 was less susceptible, and B.181 least, as judged by the proportion of plants with external symptoms. The available evidence strongly suggested that wilt incidence was closely connected with factors associated with fertility. Observations on the distribution and spread of wilt show that there is no evidence of neighbour to neighbour spread, the disease tends to be concentrated in the same areas each year, increases in severe areas but decreases in sparsely diseased areas, and that severe disease occurred only in areas of relatively good early growth. The common weed *Sida spinosa* harbours *V. dahliae*. Results are strongly against the possibility of seed transmission.

At Barberton internal boll disease (*Nematospora gossypii*) was slight in spite of a fairly general immigration of fair numbers of stainers (*Dysdercus nigrofasciatus*). That lock weight provides a satisfactory index of the degree of boll staining by *N. gossypii* [ibid., xxvii, p. 361] was illustrated by an experiment in which 20 four-week-old and 20 six-week-old bolls of each of seven varieties were inoculated each in two locks by hypodermic needle with an aqueous suspension of the spores of *N. gossypii*. At maturity, the differences in lock weight between the inoculated and uninoculated locks of four week-old bolls showed that the mean percentage losses in weight for M.U. 8A, U.4/6250, C.9363, B.P. 50/3, A.4345, U.4/5143, and A.2106 were 13·9, 20·2, 22·5, 24·6, 26·5, 29·8, and 32·5 respectively. In the material inoculated at six weeks, weight results were abandoned and the boll damage (except for A.4345) estimated from the degree of staining (1 = least stained, 6 = most stained), the gradings being (1) M.U. 8A, (2) U.4/6250, (3) B.P. 50/3, (4) C.9363, (5) U.4/5143, and (6) A.2106. This order is the same as that for weight loss. These results cannot at present be accepted as indicating with certainty that there is inherent variation in resistance to or escape from the effects of *N. gossypii*. In this experiment, and in the previous season's work, the evidence indicated that within strains, relatively poorly developed locks show relatively little staining and small loss in weight as a result of inoculation. The possibility that differential environmental influences may be responsible for differences between varieties in intensity of staining cannot yet be dismissed. *A. macrospora* and *A. gossypina* (chromogenic form) [ibid., xxvi, p. 451] were isolated from cotton leaves, the latter more generally and the former one from leaves apparently suffering from wind damage. *A. gossypina* was also associated with a pale carmine staining of lint while olivaceous-grey staining was due to *Cladosporium herbarum*.

S. H. Evelyn describes leaf-curl [cotton leaf curl virus] experiments in the Anglo-Egyptian Sudan [ibid., xxvii, p. 184] in which eight resistant Domains Sakel selections were found to be significantly more resistant (14·6 per cent. infection in January) than the commercial Domains Sakel (93 per cent.) and the surrounding spreaders (90 per cent.). Selfed seed of four R.D.S. families showed 11·6, 8·9, 20·6, and 21·2 per cent. infection compared with 87·9 to 98·3 per cent.

for 'spreaders'. In the past, leaf curl has periodically taken a very heavy toll of the Gezira crop. Should field sanitation during the close season ever be relaxed the disease is likely again to decimate the crop. Attack is chiefly confined to Domains Sakel, X.1730 A showing high resistance under Gezira conditions, though at Shambat it is more susceptible than Domains Sakel. It would seem that leaf-curl resistance can be built up in Sakel by continuous simple selection. Other work showed that the BAR.1730 strains, where attacked by blackarm (*Xanthomonas malvacearum*), were more resistant than X.1730 A ex Gash and ex Tokar, and did not shed their lower leaves and sympodia as rapidly or in such quantities. BAR. 1730 L is to be preferred among the blackarm resistant strains and is a satisfactory substitute for X.1730 A.

R. L. Knight describes work at Shambat. Seed of Evelyn's Selected Domains Sakel of B_1B_1, B_2B_2, and B_3B_3 blackarm-resistant types [ibid., xxvii, p. 280] was produced for propagation next season. The B_2B_2 type is going forward to larger-scale propagation and testing pending the integration of a type carrying all three dominant genes as a final product. Meanwhile, crosses have been made between these blackarm-resistant strains and the latest leaf-curl resistant Sakel. It is estimated that only two seasons' crossing will be necessary to combine blackarm-with leaf-curl-resistance.

At Kawanda, Uganda, H. L. Manning reports that, in work on *Verticillium* wilt, there was no evidence, on the basis of internal symptoms, that resistance in B.181 is inherited as a simple Mendelian character, but the inoculation technique used requires checking.

In some parts of Uganda cotton plants develop a growth habit referred to as 'Uganda habit' or 'columnar'. It is reasonably certain that capsid attack and blackarm together largely contribute to this with the bud and boll shedding they cause. One of the more urgent problems is to estimate the relative contribution to crop loss of each of these factors before attempting remedial measures. In Uganda, crop losses due to *X. malvacearum*, even from strains homozygous for B_2, appear to be considerable.

At Serere [cf. ibid., xxvii, p. 223] separate variety trials indicated that certain selections of the N17 group, notably S.4101, S.4106, and S.4108 showed fewer blackarm lesions per plant and gave higher yields of seed cotton than the N17 standard.

A. N. Prentice states that in Tanganyika *X. malvacearum* was widespread in the blackarm stage and was probably everywhere present in Sukumaland. It contributed to the poorness of many crops. At Lubaga, one small patch of cotton developed a fatal disease identified by G. B. Wallace as *Ascochyta gossypii* [cf. ibid., xx, p. 14].

H. C. Ducker, S. T. Hoyle, and W. L. Miller continued studies on blackarm in Nyasaland. The results of inoculations were disappointing as the expected differences between strains known to be susceptible or resistant failed to appear, while lesion development was slow. It was concluded that there must be some factor in Nyasaland inhibiting the development of typical lesions. Though the disease is commonly found in the field in Nyasaland it does not appear to be a limiting factor in crop production.

Rainey (R. C.). **Observations on the development of the Cotton boll, with particular reference to changes in susceptibility to pests and diseases.**—*Ann. appl. Biol.*, xxxv, 1, pp. 64–83, 4 graphs, 1948.

The investigations carried out at the Barberton Station of the Empire Cotton Growing Corporation, South Africa, during 1935–40, showed that male stainers (*Dysdercus nigrofasciatus*) have a marked preference for cotton bolls two to three weeks old, puncturing them to varying extents, probably primarily in a quest for

water. At this stage the bolls are high in moisture content and sugars and are most susceptible to *Nematospora* internal boll disease [*N. gossypii*, *N. coryli*, and related species: see preceding abstract]. Therefore they are likely to be attacked most severely at low humidities. Reducing sugars provide the fungus with a suitable source of carbon.

In the Transvaal the cellulose of the mature lint and the oil and protein of the ripe seed are laid down after four to five weeks, when the boll has attained its full size, and are mainly derived from materials entering the boll subsequently. Premature senescence, associated with attack by *Alternaria* [*A. macrospora* and *A. gossypina*: loc. cit.] thus has an adverse effect on yield, even when defoliation does not occur until after most of the bolls have reached full size.

Вредители и болезни Хлопчатника, Люцерны и меры борьбы с ними. [Pests and diseases of Cotton and Lucerne and their control.]—Pan Union Academy of Agricultural Sciences, Moscow, 24 pp., 1940. [Received June, 1947.]

At the 8th meeting of the Plant Protection Sections of V. I. Lenin's Pan Union Academy of Agricultural Sciences, held in Tashkent, February, 1940, Mme A. I. Soloveva and A. S. Letov reported that the incidence of cotton wilt [*Verticillium dahliae*] had become increasingly prevalent in all cotton-growing regions [*R.A.M.*, xxvii, p. 19]. For the control of the disease the introduction of compulsory prophylactic measures, such as removal of all plant debris, the use of fresh dung, and crop rotation (lucerne after cotton) is recommended. The urgent need for selection of resistant varieties and for further studies is stressed. The authors report the occurrence of a new 'lightning' cotton wilt in the dry cotton zone, the [unspecified] pathogen of which also attacks some cereal and bean [? *Phaseolus vulgaris*] crops.

D. D. Verderevsky and A. A. Vasilev state that owing to effective control measures the incidence of cotton gummosis [blackarm; *Xanthomonas malvacearum*: ibid., xvii, pp. 391, 439, 815] was negligible in Central Asia, Transcaucasia, and in the dry Ukraine areas, whereas in dry areas with insufficient control, the infection rate was 10 to 40 per cent. In wet cotton regions the infection was also considerable. In 1938 and 1939 the average infection of young seedlings in the Fergansk district, Uzbek, was 16·3 and 28 per cent., respectively, and the authors recommend the introduction of seed treatment with sulphuric acid. The seed of American cotton grown in wet districts should be treated with formalin. A centralized establishment for cotton seed treatment is proposed and the need for further selection work of immune and resistant varieties is emphasized.

Baker (K. F.). **The history, distribution, and nomenclature of the Rose black-spot fungus.**—*Plant Dis. Reptr*, xxxii, 6, pp. 260–274, 1948. [Mimeographed.]

From a detailed study of the records of the occurrence of rose black-spot fungus [*R.A.M.*, xxvi, p. 107] in Europe, America, and other areas, the author concludes that the correct binomial for the imperfect state is *Marssonina rosae* (Lib.) Lind and for the perfect state, which has been found only in the United States and Canada, *Diplocarpon rosae* Wolf. A bibliography of 114 titles is appended.

Wallace (J. G.). **Peronospora disease of Antirrhinums.**—*Gdnrs' Chron.*, cxxiv, 3210, p. 21, 2 figs. (pp. 19 and 23), 1948.

Antirrhinum [downy] mildew caused by *Peronospora antirrhini* [*R.A.M.*, xxvii, p. 72] has been reported for the first time from nurseries in Scotland where, in one case, 90 per cent. of the seedlings due to be planted out were still only two inches high and the lower-leaf surfaces coated with a felt-like mildew. The remaining 10 per cent. grew into normal, healthy plants. Although there appeared to be no great difference in susceptibility between the nine varieties concerned, Nelrose was

the most badly affected and Malmaison the least. Should this disease spread to other nurseries it may prove a serious threat to *Antirrhinum* cultivation.

JENKINS (ANNA E.) & BITANCOURT (A. A.). **A spot anthracnose of flowering Dogwood.**—*Plant Dis. Reptr*, xxxii, 6, pp. 253–255, 1 fig., 1948. [Mimeographed.]

Spot anthracnose (*Elsinoe* sp.) [*R.A.M.*, xxvi, p. 255] occurs on flowering dogwood (*Cornus florida*) in various south-eastern States of the United States. The circular to angular or irregular, reddish-grey spots measuring 1 to 2 mm. in diameter are scattered over the whole surface of the leaf. The margins are slightly raised; the centres turn slightly yellowish-grey and often drop out. The leaf apex and parts of the margin may also be completely severed. Petioles, peduncles, and twigs show similar cankers. On the floral bracts the light tan spots, measuring about 1 mm. in diameter, are surrounded by a narrow brownish to purplish-brown ring, outside which is an indistinct tan zone; they occur singly or in small groups on or near the veins. Occasional dark punctiform areas on the leaf spots represented the ascomata and on a few specimens the *Sphaceloma* state was seen.

GOULD (C. J.). **Treatments for Gladiolus corm rots in Washington : Progress Report for 1947.**—*Plant Dis. Reptr*, xxxii, 6, pp. 257–259, 1948. [Mimeographed.]

Of the various materials tested at the Western Washington Experiment Station as 5 to 15 minute dips just prior to planting for the control of gladiolus dry rot [*Sclerotinia gladioli*: *R.A.M.*, xxiv, p. 103], calogreen (1 lb. in 8 gal.) was the most effective but did not prevent *Fusarium* brown rot [*F. oxysporum* var. *gladioli*: ibid., xxvi, p. 302]. Tersan (1 in 6) and puraturf 177 (1 in 12) were both effective and slightly better than arasan SF (1 in 9). Other materials giving at least partial control were dowicide 9B (1 in 21), puratized agricultural spray (1 : 10,000 active), new improved ceresan (1 in 50), ceresan M (1 in 60), No. 307 (2-, 4-, 5-trichlorophenyl acetate, 1 in 12), and lysol (1 qt. in 50 gal.). Corms treated in December with dowicide 9B or tersan developed slightly less rot than those treated in April at planting. New improved ceresan (1 lb. in 50 gal.), ceresan M (1 in 60), and supergermite (1 qt. in 50 gal.) gave the best control of *Fusarium* rot and dry rot in eastern Washington.

Growers in western Washington are advised to use tersan for stocks lightly infected with dry rot and calogreen for those heavily infected. For the control of dry rot and *Fusarium* rot in eastern Washington lysol or supergermite (3 to 6 hours), new improved ceresan, and ceresan M are recommended. All diseased corms should be discarded. Against *Botrytis* corm rot [*B.* (?) *cinerea*: ibid., xx, p. 468] fungicidal treatments were ineffective and the artificial drying of corms immediately after lifting is suggested.

BAKER (K. F.). **Fusarium wilt of garden Stock (Mathiola incana).**—*Phytopathology*, xxxviii, 5, pp. 399–403, 2 figs., 1948.

During September, 1946, an important *Fusarium* disease, characterized by premature leaf fall, stunting, brownish discoloration of the vascular elements in roots and stems and the development of flattened, faded, light tawny siliquas containing undeveloped seeds, was observed in seed fields of garden (*Matthiola incana*) and ten weeks stock (*M. incana* var. *annua*) in Santa Barbara County, California. A similar disease killed nearly all of the stocks in a Los Angeles garden about 1928. Young seedlings frequently wilted and died within 30 to 40 days after being transplanted into heavily inoculated soil held at 21° to 24° C. The basal leaves of older plants showed conspicuous vein-clearing before they turned yellow, withered, and dropped. The fungus was consistently isolated from affected plants and from commercial seed in the same fields, and its pathogenicity established.

Since the *Fusarium* proved non-pathogenic to cabbage, kale, and radish and the cabbage form [*F. conglutinans*: *R.A.M.*, xxv, p. 359] did not infect stocks, the pathogen is designated as *F. oxysporum* f. *mathioli* n.f. The fungus is commonly seed-borne, probably internally.

Since stocks require temperatures below 18° for flower bud initiation and are grown during the winter months, whereas vascular *Fusarium* diseases are favoured by warm soils (24° to 25°), the disease may prove to be important only in the seed crop which grows throughout the summer when conditions are favourable for its development.

HAWKER (LILIAN E.). **Basal rot of Narcissus due to Fusarium bulbigenum Cke and Mass.**—*Daffodil Yearb., 1946*, pp. 78–83, 1 pl., 1 graph, 1946. [Received May, 1948.]

An account is given of the symptoms and control of the basal rot of *Narcissus* and daffodil [*N. pseudonarcissus*] caused by *Fusarium bulbigenum* [*R.A.M.*, xxiii, p. 344; xxvi, p. 302]. It is concluded that satisfactory control should result from attention to storage and transport conditions with care in handling, lifting in dry weather combined with early cleaning to accelerate drying, the routine incorporation of 0·2 to 0·5 per cent. formalin or other fungicide in the hot-water bath, and the use of a cold fungicidal steep about one week after lifting in cases where high temperature or a high percentage infection of a stock renders severe wastage likely before the hot-water treatment can be safely applied.

BAKER (K. F.). **Diseases of Delphinium in California.**—*Amer. Delphinium Soc. Yearb., 1947*, pp. 15–30, 1947.

Notes are given on the symptoms, causes, and control of the following *Delphinium* diseases in California: aster yellows [*R.A.M.*, xxii, p. 206; xxv, p. 396], bacterial crown and stem rot (*Erwinia phytophthora*) [ibid., xxiii, p. 20], and powdery mildew (*Erysiphe polygoni*) [ibid., xxv, p. 578] (all important locally); bacterial leaf spot (*Pseudomonas delphinii*) [ibid., xxv, p. 330], root rot (*Pythium ultimum* and *P. vexans*), and *Diplodina* disease [ibid., xx, p. 66] (all destructive occasionally); and non-parasitic chlorosis, tomato spotted wilt [ibid., xxv, p. 395], *Sclerotium* crown rot [*S. rolfsii*: ibid., xxvi, p. 341], celery calico [ibid., xxv, p. 396], ring spot [ibid., xxv, p. 395], beet curly top [loc. cit.], and seedling damping-off (*Rhizoctonia* [*Corticium*] *solani*) (all relatively unimportant locally).

Aster yellows of *Delphinium* (perennial spp.) and annual larkspur (*D. ajacis* and *D. consolida*) is largely confined to the Pacific coastal and Rocky Mountains area. Occasionally, it occurs on larkspur and possibly on *Delphinium* in New York. On the west coast it is so important and destructive that it constitutes a limiting factor in *Delphinium* cultivation. In California it is an important reason for the garden culture of this plant on an annual or biennial basis, because of the losses in the second season. It is prevalent in some seasons and rare in others. Control methods suggested for field plantings include the use of virus-free stock, weed destruction, roguing, the avoidance of planting sites near weed areas or old *Delphinium* or celery fields, growing the cut-flower as an annual and the seed crop as a biennial, the exclusion of insects by growing under glass or cloth, insecticidal treatment, and, possibly, hot-air treatment.

Control of *E. phytophthora* in field plantings consists in a proper regulation of soil moisture, and rotation; hot-water treatment is recommended for larkspur seed if it is to be planted in new land. In gardens the most important preventive measure is again the regulation of soil moisture, but the ornamental should be replanted every year and if serious losses occur, rotation should be practised while a Bordeaux spray might be tried. In greenhouse conditions all soil should be

steamed or treated with chloropicrin, and larkspur seed should be given hot-water treatment.

The fact that larkspur is highly resistant to *Erysiphe polygoni* in Michigan but severely affected in California indicates that two strains are involved. Species reported as resistant include *D. tatsiniense*, *D. grandiflorum*, *D. scopulorum* var. *glaucum*, *D. cardinale*, and *D. purpusii*. Control depends on improved cultural practices and sulphur dusting.

Hardison (J. R.). **Field control of blind seed disease of perennial Ryegrass in Oregon.**—*Phytopathology*, xxxviii, 5, pp. 404–419, 1 graph, 1948.

The control of blind seed disease (*Phialea temulenta*) [*R.A.M.*, xxvii, p. 116] of perennial ryegrass (*Lolium perenne*) [ibid., xxiv, p. 151] is extremely important to Oregon farmers since the crop is grown primarily for seed on land unsuited to other profitable crops.

Control of the disease by preharvest tests has proved impracticable in Oregon and has been replaced by inspecting seed samples from the previous year's crop to eliminate badly diseased fields. A measured quantity of seed is soaked for 20 minutes in an equal amount of water and the number of macroconidia in the water suspension is determined by means of a haemacytometer. For the convenience of growers, disease severity has been classified into nine stages from 0 to extremely heavy, from which the necessary field recommendations for the next crop can be made. Fields expected to produce a heavy infection should be ploughed up. Only certified disease-free seed is recommended for planting new seed-producing fields.

The spread of the disease was eliminated by planting seed 20 to 22 months old for spring sowing and over 24 months old for winter sowing. Tests carried out in 1944 and 1945 showed that no apothecia were produced the following spring when seed of this age was sown nor when seeds were planted at a depth of half an inch or more with complete soil coverage.

In 1944 the straw accumulation from a heavily infected crop with only 48 per cent. germination was burned after harvest. The average germination in the 1945 crop was 96 per cent. and 90 and 93 per cent. for two other diseased fields burned after harvest. In all cases infection and damage to seed crops was very slight. In Oregon, burning as a remedial control measure is recommended only for fields with marginal infestation after the first or second year's crop. Heavily infested fields should be ploughed up before May to suppress the emergence of apothecia.

No disease was found on regrowth heads produced after the regular seed harvest in 1945 and 1946. Infection was consistently heavy in poorly drained, waterlogged fields and in seasons when rainfall was considerable in May and early June.

The application of these control measures during the winter of 1944 resulted in a marked reduction in the amount of badly diseased seed entered for certification and a decided improvement in the crops.

Weimer (J. L.) & Luttrell (E. S.). **Angular leaf spot of Kudzu caused by a new species of Mycosphaerella.**—*Phytopathology*, xxxviii, 5, pp. 348–358, 3 figs., 1948.

In October, 1945, a leaf disease of kudzu (*Pueraria thunbergiana*) [*P. hirsuta*] was observed in a planting at Experiment, Georgia, where it caused premature shedding and injury. The same disease occurred also at two other localities and in May, 1947, was found in several counties in Georgia and in two places in Alabama. It has already been reported from Mississippi [*R.A.M.*, xxvi, p. 399]. The leaves, which are attacked at all ages, develop mainly angular light-brown yellowish-edged lesions becoming dark brown to black with grey centres and darker margins when old. The small, scattered lesions first appear on the upper surface of the leaf and gradually enlarge and coalesce. Severely affected leaves may turn

from yellow to brown and finally drop off. In the field the spots vary from 1 to 10 mm. in diameter with an abundance of dark-brown conidial tufts on the upper surface of the leaf.

The causal fungus appears to be identical with *Cercospora puerariicola* [loc. cit.] and the perithecial state was found on overwintered kudzu leaves. Cultures from ascospores were identical in appearance with those of *C. puerariicola* and produced lesions on seedlings identical with those caused by cultures derived from conidia. The perithecial fungus is described as *Mycosphaerella puerariicola* n.sp. The spherical short-necked perithecia measure 61 to 93 μ in diameter and 70 to 115 μ in height. The asci are fasciculate, aparaphysate, clavate, shortly stipitate, 44·8 to 60·8 by 9·3 to 9·9 μ and contain 8 hyaline or pale-green, uniseptate, fusoid or clavate, straight or slightly curved ascospores, rounded at each end, slightly constricted at the septum, 14·3 to 24·2 by 2·7 by 4·5 μ. The black, punctiform spermogonia, 42 to 67 μ, produce hyaline bacillary spermatia, 3 by 1 μ. The conidial measurements are given as 25·2 to 126 by 3 to 5·3 μ. Growth of the fungus was most rapid on agar at 26° to 28° C., the colonies being hemispherical and olivaceous in colour.

Initial infection in the spring is caused by ascospores or conidia from overwintered leaves. In 1947, mature ascospores were not found in the field until May, but doubtless usually develop earlier. The fungus is probably carried to new localities on diseased leaf fragments transported with the young plants. Therefore the choice of clean propagating material is recommended, together with the use of seed disinfected by soaking in commercial sulphuric acid for one hour at 60° F.

Erickson (E. L.). **Forage from Kochia, Kochia scoparia L.**—*Bull. S. Dakota agric. Exp. Sta.* 384, 27 pp., 9 figs., 1 graph, 1 map, 1947.

Seedlings of the locally valuable forage plant *Kochia scoparia* are attacked in South Dakota by damping-off caused by an organism provisionally identified as *Pythium debaryanum*. The symptoms are most pronounced at temperatures of 78° to 85° F. and when the soil is wet.

Hardison (J. R.). **Occurrence of anther mold in Ladino Clover in Oregon.**—*Plant Dis. Reptr*, xxxii, 6, p. 242, 1948. [Mimeographed.]

During the winter of 1946–7 the author obtained from seeds of ladino clover (*Trifolium repens* var. *ladino*) from southern Oregon a fungus apparently identical with *Botrytis anthophila* [*R.A.M.*, xiii, p. 381]. Tests of 750 shrunken and shrivelled seeds on potato dextrose agar yielded less than 0·5 per cent. of *B. anthophila*. It is suggested that the fungus can be isolated only from damaged seed. In August, 1947, one ladino clover flower, among several thousand examined, showed the characteristic 'anther mould', this being the first record of the disease on this host, and the first record of the fungus in the United States.

Săvulescu (T.) & Tomescu (V. C.). **Recherches sur la bactériose de l'Herbe de Sudan.** [Researches on bacteriosis of Sudan Grass.]—*Bull. Sect. sci. Acad. roum.*, xxii, 9, pp. 404–407, 1940. [Received April, 1948.]

This study completes the description of the bacteriosis of Sudan grass (*Sorghum exiguum*) [? *S. sudanense*] in Rumania caused by *Pseudomonas holci* [*R.A.M.*, v, p. 741; xi, p. 364; xxii, p. 18] and of the characters of the organism.

Kauter (A.). **Maladie à sclérotes du Trèfle.** [Sclerotial disease of Clover.]—*Rev. romande Agric., Vitic., Arboric., 1948*, 1, pp. 1–2, 1 fig., 1948.

The author points out that progressive deterioration in successive crops of purple clover in Switzerland is often caused by *Sclerotinia trifoliorum* [*R.A.M.*, xxvi, pp. 297; xxvii, p. 283]. While infection is spread to some extent by the spores, it is propagated mainly by the sclerotia, which develop in autumn and winter and

remain viable in the soil for many years. Massive infection is a sure indication that the soil is contaminated. Growth of the fungus lasts from October to May, and the severity of an attack depends mainly on the temperatures that prevail in November and December, a warm spell favouring the parasite. Attack is also favoured by close sowing.

The heaviest attacks occur on carnation clover [*T. incarnatum*] and *T. pratense*, whereas lucerne is highly resistant; sweet trefoil [*Lotus* sp.], hybrid clover [*T. hybridum*], and creeping clover [*T. repens*] are not very susceptible, though lupuline [*Medicago lupulina*] and anthyllis [*Anthyllis* sp.] are somewhat readily attacked.

Control is recommended by the use of resistant host varieties and improved cultural methods, including rotation.

Keitt (G. W.), Leben (C.), & Shay (J. R.). **Venturia inaequalis (Cke.) Wint. IV. Further studies on the inheritance of pathogenicity.**—*Amer. J. Bot.*, xxxv, 6, pp. 334–336, 1948.

Continuing their series of studies [cf. *R.A.M.*, xxiii, p. 66; xxiv, p. 193, and next abstract] the authors isolated the ascospores of progeny which resulted from crossing *in vitro* a mono-ascosporic line of *Venturia inaequalis* [ibid., xxvii, pp. 284, 425] that incites typical scab lesions on Haralson and Wealthy and flecks on Yellow Transparent and McIntosh apples with each of two mono-ascosporic lines that incite flecks on Haralson and Wealthy and lesions on Yellow Transparent and McIntosh. The resulting lines were tested for pathogenicity to the leaves of each of the four varieties. In each ascus tested segregation for pathogenicity to each variety, as indicated by the lesion and fleck reactions, was in a 1 : 1 ratio. Analysis indicated that pathogenicity to Haralson and Wealthy and to Yellow Transparent and McIntosh was determined at two separate and distinct loci.

Leben (C.) & Keitt (G. W.). **Venturia inaequalis (Cke.) Wint. V. The influence of carbon and nitrogen sources and vitamins on growth in vitro.**—*Amer. J. Bot.*, xxxv, 6, pp. 337–343, 4 figs., 1948.

The pathogenic capabilities of four pathogenic, wild-type lines and three non-pathogenic, mutant lines of *Venturia inaequalis* [see preceding abstract] grown *in vitro* were found to be entirely independent of the carbon, nitrogen, or vitamin nutrition of the various lines.

Scurti (J.). **Sulla pseudosuberosi delle Mele.** [An Apple pseudo-suberosis.]—*Ann. Sper. agr.*, N.S., ii, 2, pp. 247–253, 4 figs., 1948. [English summary.]

Apple fruits of the Belfort and Delicious Rossa varieties in the province of Verona are affected by pseudo-suberosis, causing fruit drop. Livid, depressed areas appear on the surface of any part of the skin, enlarge, and turn brown. The underlying flesh is at first unaffected, but later it becomes spongy or fibrous and also turns brown, the depression itself becoming more evident. Finally the brown fibrous flesh reaches to the seed cavities though there is no further change of colour on the skin; where the depressions are very conspicuous, however, the flesh is extensively affected. There are no lesions on the skin at the spots.

Microscopic examination showed no morphological abnormality in the epidermis, or in the outer layers of the flesh parenchyma. In the deeper layers the peripheral cells of the discoloured flesh contained in the cytoplasm compact, homogeneous, vacuolar or granular, round, oval, or somewhat elongated bodies, mostly 3 to 6μ long, apparently identical with the X-bodies of virus diseases [*R.A.M.*, vii, p. 426; ix, p. 539]. At the centre of the affected regions deep lesions were sometimes found, accompanied by loss of protoplasm, rupture of the cell wall, and confluence of several cells. No suberization of the walls was observed. There was no distinct line of demarcation around the affected parts, which also suggested that the

condition was of virus origin. The presence of masses of starch grains in many cells in the affected parts showed that the disease had begun before the starch was transformed during ripening into sugar.

The greatest loss due to the condition was entailed by fruit fall. The palatability of the apples was little affected, but their appearance was spoiled. The keeping qualities were much impaired, the disease progressing during storage and opening the way to rotting organisms.

The condition is attributed to a dry soil, prolonged drought followed by heavy rain during ripening, excessive pruning, boron deficiency, and possibly, virus attack.

Dunegan (J. C.). **Trends in plant disease control with fungicides.**—*Agric. Chemicals*, iii, 2, pp. 32–34, 1948.

In this paper, read at the Fungicide Colloquium, American Phytopathological Society, Chicago, in December 1947, the author states that the present-day trend in the control of diseases of deciduous fruit is towards the use of specific organic compounds for specific diseases. Thus, in Oregon, ferric dimethyl dithiocarbamate gives control of pear scab [*Venturia pirina*: *R.A.M.*, xxvi, p. 347], equal to that obtained with any form of elemental sulphur with no deleterious effects. The use of 2,4-dichloro 1,3-naphthoquinone against severe outbreaks of apple bitter rot [*Glomerella cingulata*: loc. cit.], and the phenyl mercury compounds for apple scab [*V. inaequalis*: ibid., xxvi, p. 455] are also cited as specific controls.

Buchholtz (W. F.) & Nagel (C. M.). **Leaf curl and pockets control by a lime-sulphur dormant spray.**—*Bull. S. Dakota agric. Exp. Sta.* 380, 8 pp., 1 diag., 1945. [Received July, 1948.]

Satisfactory control of the disease of plums and sand cherries (*Prunus besseyi*) known locally as 'leaf curl and pockets' and caused by *Taphrina communis* [*R.A.M.*, viii, p. 405; xviii, p. 414] is given under South Dakota conditions by a single dormant spray of lime-sulphur 1 in 9 applied in autumn after leaf-fall or during spring but before 1st April. The fungus overwinters only as spores on the over-wintering buds of the host. Spraying should be effected every year.

Demaree (J. B.). **Brown berry disease of black Raspberries.**—*Plant Dis. Reptr*, xxxii, 6, pp. 251–252, 1948. [Mimeographed.]

Investigations into the brown berry disease of black raspberries [*Rubus occidentalis*: *R.A.M.*, xx, p. 312] refute the previously suggested relationship between the disease and mild streak [ibid., xxiv, p. 457; xxvii, p. 374] which, in the author's opinion, are two distinct diseases. Their simultaneous occurrence in the same field or on the same bush is merely coincidental. Inspections of black raspberry fields revealed high incidence of mild streak in the absence of brown berry symptoms, and brown berry symptoms without those of mild streak. The symptoms of the two diseases can be easily distinguished. Brown berry, as observed by the writer in Ohio and Pennsylvania, the only two States from which it has been reported, causes one to several fruits in a cluster to die during the green stage; they become brown, dry, hard, and seedy and cling tightly to the receptacle. Unaffected berries in a cluster develop normally. The characteristic symptoms of mild streak do not show until the berries are ripening, when they lack lustre, remain small, and are poorly flavoured, all berries on a diseased bush being affected. Pulp and juice are somewhat reduced, but the berries are not dry and never turn brown.

Bongini (Virginia). **Cancro del Cachi.** [Persimmon canker.]—*Ann. Sper. agr.*, N.S., ii, 1, pp. 107–127, 15 figs., 1948. [English summary.]

Since 1945, persimmons (*Diospyros kaki*) in various parts of Piedmont, Italy, have been affected by a progressively fatal form of canker. In the worst cases,

affecting well-growing productive trees four to seven years old, a canker develops at the base of the trunk a few cm. above soil level. The cortical cylinder becomes detached, leaving the dead wood bare. In other instances, no trunk canker is present, but longitudinal cracks appear in the periderm, with small cankers along the branches. In nearly all cases, a slightly depressed area forms on the bark, later crossed by a longitudinal split 2 or 3 cm. long, which gradually deepens and widens. As the canker enlarges, further small transverse splits appear in the affected part, causing progressive detachment of pieces of the cortical cylinder. The canker thus spreads in a girdle, leaving the dead woody cylinder bare to a width of up to 15 cm. At this stage, all the aerial parts have withered, though the roots and collar remain healthy, and new shoots develop. These grow normally for a few years and then in turn become affected and wither. Sometimes detachment of the bark spreads upwards or downwards, causing a spiral or oblique canker. Small pustules break through the periderm at the edge of the affected part.

The pericambial cylinder contains brown stromata and subepidermal, sparse, or loosely gregarious pycnidia. The latter were occasionally confluent, immersed, later erumpent, papillate, brown, globose or globose-depressed, or variously shaped; they were surmounted by a chlorine-brown to carbonaceous stroma, in which (when the cavities were deep) there was a channel for the emission of the spores. In globose-depressed pycnidia the cavity averaged 240μ wide and 160μ deep; in phial-shaped ones, 270 by 180μ or 160 by 190 to 220 by 270μ; and in lenticular ones 750 by 108μ. The cavity was lined with aciculate conidiophores, 12 to 13μ long, and contained a thick mass of hyaline spores which often emerged in a voluminous cirrus. These beta-spores were filiform, non-septate, slightly rounded at the extremity, almost all flexuose, and mostly curved at one end in the shape of a hook. They averaged 25 by 1·5μ. Alpha-spores were very seldom found; already disarticulated, they were ovoid, biguttulate, 5 by 2·5μ to 7 to 8 by 3 to 3·5μ, usually 6 to 7 by 3·5μ. The fungus is considered to be a new species of *Phomopsis*, and is named *P. diospyri* n. sp.

In view of the different symptoms observed in nature in different localities, the author considers that there are three distinct strains of the fungus responsible for the disease: A, causing annular canker on productive trees; B, causing withering of the shoots of nursery seedlings; and C, causing withering of the branches in young non-productive nursery trees. Experimental inoculations were made with strain A.

Only inoculations with mycelium under normal conditions of humidity and temperature (12°, 15°, and 16°) in the laboratory caused characteristic necrosis in a few cells. At 20° to 25° with high humidity and in a confined space with reduced light, infections were obtained by inoculating with spores or mycelium, even on unwounded branches. The fungus penetrated deeply and caused disorganization of the sub-epidermal tissue, cellular necrosis, and the formation of the initial depressed area, followed by the development of sub-epidermal, later erumpent, pustules. When lesions were not present, penetration of the mycelium occurred only through the lenticels. After penetration, fungal development was rapid in the cortical tissues, and caused immediate necrosis in the wood, even at a distance from the infected zone. Twenty days elapsed between infection and fructification. The evidence shows that *P. diospyri* attacks persimmon as a parasite in very favourable conditions of humidity, probably during the spring rains. In less favourable conditions it appears to behave as a wound parasite. In the hottest part of the summer new infections do not occur, but the mycelium continues to spread slowly in the host.

As the roots remain unaffected, control consists in removing the diseased parts and treating the new shoots in autumn and spring with a mixture of milk of lime and copper sulphate (3 to 5 per cent.).

Arnstein (H. R. V.), Cook (A. H.), & Lacey (Margaret S.). **The inhibition of Fusarium oxysporum var. cubense by musarin, an antibiotic produced by Meredith's Actinomycete.**—*J. gen. Microbiol.*, ii, 2, pp. 111–122, 1 fig., 1948.

Under selected conditions Meredith's actinomycete [*R.A.M.*, xxvi, p. 160] produced antifungal culture liquids from which the active principle named musarin, an optically active acid of high molecular weight, has been isolated by two methods.

Tests indicate that musarin is one of the most powerful antifungal antibiotics, completely inhibiting spore germination of 16 fungi at dilutions of 1 to 50,000 to 1 to 800,000. It is particularly active against *Verticillium dahliae*, *V. albo-atrum*, *Corticium solani*, *Sclerotinia fructigena*, *Botrytis cinerea*, *Ceratostomella paradoxa*, *Fusarium oxysporum* var. *cubense*, *F. lateritium* [*Gibberella lateritia*], *F. culmorum*, and *F. lini*. It is suggested that musarin may prove useful in controlling Panama disease of bananas (*F. oxysporum* var. *cubense*) and other diseases of economic importance. Its antibacterial activity is less effective.

Zentmyer (G. A.) & Klotz (L. J.). **Avocado decline.**—*Calif. Citrogr.*, xxxiii, 3, pp. 116–118, 1948.

The authors suggest that avocado root rot is a more definite and descriptive term for avocado decline, which is due, in California, to attack by *Phytophthora cinnamomi* under conditions of high soil humidity [*R.A.M.*, xxvii, p. 327]. The current experimental research programme to aid in combating the disease is reviewed. Soils treated with fumigants and fungicides have been replanted with seedlings and young trees, and already in some cases better growth has been observed, especially after the use of ethylene dibromide and dowfume N, two products of the Dow Chemical Company. Various fungicides are being tested for toxicity to *P. cinnamomi*, together with materials applied to the soil to promote antifungal activity. Low doses of ethylene dibromide as well as dowfume N, copper sulphate, and various organic fungicides applied to the roots of trees have conferred some initial benefit. In watering experiments, root rot was accelerated most in trees receiving twice the normal water supply at each watering. In susceptibility tests, to date, the Guatemalan varieties have proved more susceptible to injury by *Phytophthora* spp. and waterlogging than have the Mexican varieties. Other tests indicate that the disease may be spread by nursery stock.

Wallace (G. B.) & Wallace (Maud M.). **Diseases of Papaw and their control.**—*E. afr. agric. J.*, xiii, 4, pp. 240–244, 6 figs., 1948.

Brief notes are given on the symptoms and control of the following papaw diseases in East Africa: *Pythium* root rot (*Pythium* spp. including *P. aphanidermatum*) [*R.A.M.*, xxiii, p. 235; xxv, p. 154], *Armillaria* root rot (*A. mellea*), mosaic [cf. ibid., xxvi, p. 402, 458], the mildews *Oidium caricae* [ibid., xxvi, p. 114] and *Ovulariopsis papayae* [ibid., xxiii, p. 235], leaf and fruit spot (*Ascochyta caricae*) [ibid., xx, p. 560; xxiii, p. 448], fruit rot (*Phytophthora parasitica* and probably other *P.* spp.) [ibid., xxv, p. 154], anthracnose (*Colletotrichum gloeosporioides*) [ibid., xxiii, p. 235], and a diseased condition of young trees, probably due to climatic factors, observed in the Northern Province of Tanganyika in 1947.

Indagini tossicometriche sugli anticrittogamici XXIII–XXIX. [Toxicometric researches on fungicides. XXIII–XXIX.]—*Atti Ist. bot. Univ. Pavia*, Ser. 5, iii, 4, pp. 227–269, 8 graphs, 1947. [English summaries.]

In contribution XXIII (pp. 227–232) of this series [cf. *R.A.M.*, xxv, p. 223] F. Bertossi gives a series of tables compiled by himself for the preparation of dilutions based on geometrical progression.

In No. XXIV (pp. 233–237), R. Ciferri and G. Scaramuzzi, dealing with the metabolism of the micro-organic population of the soil and the solubilization of cuprous oxide in the soil, show that when determinations were made of copper dissolved from cuprous oxide by soil extracts in water the amount yielded was approximately the same as that obtained from ordinary, undistilled water. Solubility of cuprous oxide was greatly increased by the addition of glucose, and still more increased by gelatine or glucose and gelatine.

In No. XXV (pp. 238–242), R. Ciferri, E. Baldacci, and G. Borzini, dealing with biological interactions between derivatives of mercury and cysteine, show that in the case of some organic mercury compounds cysteine has no effect on fungistatic properties while in others it increases or reduces it. In six compounds a parallel was established between fungistatic activity in the presence of cysteine and the phenolic coefficient.

In No. XXVI (pp. 243–244), G. Borzini and R. Ciferri, after stating that the increased prevalence of wheat bunt (*Tilletia* spp.) [*T. caries* and *T. foetida*: ibid., xxv, pp. 252, 495; xxvii, p. 415] in Italy during the war has led to the opinion that the fungicides used for seed treatment were of inferior fungicidal quality, describe an experiment carried out with Caffaro powder, containing about 16 per cent. copper, and Granovit Rumianca, containing 3 per cent. metallic mercury and 4 per cent. furanic aldehyde, in which inoculated Roma wheat seed was treated with 0·5 per cent. by weight of these two materials before sowing. The results showed that the untreated controls had 65·1 per cent. bunted ears and 73·17 per cent. bunted seeds, the corresponding figures for Caffaro powder being 12·8 and 17·67 per cent. and Granovit Rumianca 12 and 12·47 per cent. It is concluded that neither product shows less fungicidal activity than formerly.

In No. XXVII (pp. 244–252), G. B. Marini-Bettòlo and G. Borzini describe tests of a number of organic mercury compounds against wheat bunt. The results showed that benzaldehyde, anisaldehyde, and salicylic aldehyde used with mercuric chloride and containing 1 to 4 per cent. of the metal were highly effective, while cinnamaldehyde and metanitrobenzaldehyde with mercuric chloride were less active, and other mercury compounds were unsatisfactory. Cadmium-furfural was effective only when used at relatively high concentrations. The effect of the mercury complexes and compounds on absolute germinability of dusted wheat seed was inappreciable, but rate of germination was diminished in some cases by the complexes containing the different aldehydes with mercuric chloride.

In the first part of No. XXVIII (pp. 253–260), R. Ciferri and E. Baldacci show that the addition of zinc sulphate did not inhibit the fungistatic effect of 8-hydroxyquinoline towards *Alternaria tenuis*, *Fusarium oxysporum*, *F. moniliforme* [*Gibberella fujikuroi*], *F. solani*, and *Penicillium notatum* [ibid., xxvi, p. 161]. In the second part R. Ciferri and G. Scaramuzzi state that when conidia of *F. solani*, *Botrytis cinerea*, *Sclerotinia fructigena*, *A. tenuis*, *Cladosporium herbarum*, *Macrosporium* [*Stemphylium*] *sarciniforme*, and *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] were germinated in specially prepared zinco- and cupro-oxyquinoline complexes in solution from saturation to a dilution of 1 in 100, the species showed differing degrees of susceptibility to the different dilutions. This confirms the view that hydrolysis or decomposition of the complexes not liberated by the cations may have played a part or that new complexes may have formed with different fungicidal activities. Both the zinco- and cupro-oxyquinoline complexes appeared to exert a marked fungistatic effect on conidial germination.

In No. XXIX (pp. 261–269), work by G. B. Marini-Bettòlo and G. Borzini on the mechanism of fungistatic action is described. The results showed that the fungistatic activity of chinoid staining substances capable of reversible redox is not always strictly related to redox potential, though the more active lie between −0·15 and +0·15 volts. The fungistatic activity of staining substances of the

triphenylmethane group (without reversible redox power) is more closely related to an advanced stage of oxidation than to quinoid structure. The low fungistatic activity of certain triphenylmethane derivatives is due to the presence of sulphonic groups in their molecule.

Johnson (F.) & Campbell (L.). **Fungicides in tablet form?**—*Agric. Chemicals*, iii, 2, p. 35, 1948.

The authors recommend, for the preparation of small quantities of sprays by the home gardener, the compression of fungicides into tablets or capsules which, dissolved in a specified amount of water, would give the correct concentration. They have compressed several of the organic fungicides, basic coppers, and sulphur into tablets which disperse easily and speedily in cold water.

Gray (J. R.). **Colloidal sulphur and colloidal copper compound for the control of fungus diseases.**—*C. R. I^er^ Congr. int. Phytopharm.*, pp. 133–143, 1946. [Received June, 1948.]

The author reviews the properties of colloidal sulphur and colloidal copper, and discusses their advantages in the control of plant diseases.

Turner (J. N.), Musgrave (A. J.), & Rose (C. D.). **Fungicides for the leather industry: an annotated list.**—*J. Soc. Leath. Tr. Chem.*, xxxii, pp. 127–143, 1948.

A table is given listing all the fungicides that have been recommended for use in the leather industry [see next abstract], with others which seem likely to be of use, having been tested for use in other industries. The fungicides are listed alphabetically according to their chemical names and the table gives in separate columns a reference to the original paper (listed in a bibliography of 35 titles) on which the information is based, the material used as substrate in the tests, the solvent used, the test fungus used, the material to be treated, relevant remarks (on the properties of the substance and its effect on the leather, &c.), solubility in water, solubility in other solvents, and a broad assessment of the fungicidal value of each substance. This assessment is based on information provided by the original investigator. A short list of the more effective fungicides, whose value has been recognized by more than one investigator, comprises *p*-chloro-*m*-cresol, *p*-chloro-*m*-xylenol, ethyl mercuric chloride, mercuric chloride, β-naphthol, *p*-nitrophenol, pentachlorophenol, phenol, phenyl mercuric acetate, phenyl mercuric nitrate, salicyl anilide, sodium β-naphtholate, sodium pentachlorophenate, sodium trichlorophenate, and trichlorophenol.

Musgrave (A. J.). **The mycology of the leather industry. (A review and a bibliography.)**—*J. Soc. Leath. Tr. Chem.*, xxxii, 3, pp. 3–18, 1948.

This account, based on the literature of the subject of the mycology of the leather industry [cf. *R.A.M.*, xxvii, p. 191], reviews briefly the biology of industrial fungi and lists the fungi recorded on leather, gives a more detailed account of the incidence and effect of those occurring during the different processes of leather manufacture and on the finished article, and describes available methods of control [see preceding abstract]. Among much that is interesting, the following points may be mentioned.

There exists at present no complete list of the fungi associated with the leather industry, largely owing, probably, to difficulties of identification. The need for experts in the identification and classification of fungi in industrial mycology is apparent. Species of *Penicillium* and members of the *Aspergillus niger* and *A. glaucus* groups commonly occur in the leather industry [cf. ibid., xxv, p. 410]. In 1935, Stuart and Frey examined hide specimens from animals whose skins had been affected before death by ringworm due to a species of *Trichophyton*. The

damage affected primarily the grain layer of the leather but also extended into the upper part of the corium. The suggestion was made that if the detection of diseases in unprocessed hides and skins could be facilitated, the time and labour involved in attempting to remedy the trouble after processing would be obviated.

In conclusion, the author expresses the view that in most of the research done on the mycology of leather there has been a lack of identification of the moulds and yeasts concerned. There is a general absence of information as to the extent of the injury caused to the leather-making properties of skins by fungal diseases in the living animal. Nothing is known about the damage done to different kinds of leather by different species of moulds; neither is it known if leather which has supported a particular species of mould should be reserved for limited use. The nutritional physiology of leather fungi would repay further study.

The list of references cited in the text comprises 79 titles, and there is an additional bibliography of 55 items.

White (W. L.), Darby (R. T.), Stechert (Gladys M.), & Sanderson (Kathryn). **Assays of cellulolytic activity of molds isolated from fabrics and related items exposed in the tropics.**—*Mycologia*, xl, 1, pp. 34–84, 3 pl., 1948.

The results are presented of a number of assays made to determine roughly the cellulolytic activity, as measured by decline in tensile strength of cotton fabric, of fungi isolated from textiles and related materials deteriorated in the tropics, the basic method used being that of Greathouse, Klemme, and Barker [*R.A.M.*, xxii, p. 73].

Among the Mucorales [cf. ibid., ix, p. 784; xxiii, p. 309], six species tested all gave negative results, but a seventh culture, *Zygorrhynchus moelleri* (Fla *A*-29), finally showed its apparent cellulolytic activity to be due to the action of an internal Dematiaceous parasite, which grew out of its host and attacked the cloth. Evidence is accumulating that the Mucorales are unable to utilize cellulose as a source of carbon or to degrade it directly.

All the *Aspergillus glaucus* group tested were negative. In the *A. fumigatus* group, the one culture of *A. fischeri* tested gave positive results in each of three assays, while three strains of *A. fumigatus* were positive and three negative. The capacity to decompose cellulose is probably general in the *A. fumigatus* group [cf. ibid., vi, p. 500; vii, p. 268; x, p. 552]. In the *A. nidulans* group seven strains of *A. unguis* gave negative results, while the one culture of *A. nidulans* tested gave doubtful or negative results. Cultures of *A. ustus* and its var. *laevis* made considerable growth without causing any pronounced decline in tensile strength. It may be that cellulolytic ability will be found to be general in the *A. ustus* group under relatively restricted optimal conditions. Weak cellulolytic activity was demonstrated for three cultures of *A. flavipes* tested, whereas the many cultures of *A. versicolor* and *A. sydowi* examined were all negative. The seven cultures of *A. terreus* tested grew and fruited readily and consistently; this is perhaps the most strongly and consistently cellulolytic species of the genus. Of the numerous cultures of the *A. niger* group tested, only *A. luchuensis* gave positive results. The single culture of the *A. wentii* group tested gave negative results. No activity was noted in three isolates of *A. tamarii*, in numerous cultures of *A. flavus* and *A. oryzae*, or in two of *A. ochraceus*.

With *Penicillium*, the only clearly positive results were with some of nine strains of *P. luteum*, some of *P. citrinum*, and two unidentified forms, PQMD *111b* and Fla *B-54*. The positive results previously recorded for *P. chrysogenum*, *P. notatum*, *P. purpurogenum*, *P. rugulosum*, and *P. spinulosum* were not confirmed, though taxonomic confusion might partly account for this.

Among the Moniliales, tests with ten species and varieties of *Fusarium* indicated that substantial cellulolytic activity is probably the rule in this genus. With

the species of *Gliocladium* represented by Weindling's culture G-1 (and generally referred to as *G. fimbriatum* or *Trichoderma viride*, though distinct from either) cellulolytic activity appeared to be strong in some strains and weak or absent in others; one strain of *G. roseum* was cellulolytic. Seven cultures of *Humicola* tested, representing two species, were all strongly cellulolytic. Of 17 strains of *T. viride*, all were relatively strongly cellulolytic.

In the Dematiaceae, five cultures of *Alternaria* were tested, all identified with strains commonly referred to *A. tenuis*; they displayed relatively uniform and fairly strong activity. Six cultures of *Brachysporium* showed similar activity to that of the *Alternaria* group. With *Cladosporium herbarum* the results indicated varying and, on the whole, not strong cellulolytic activity. Ten isolates distributed among three species of *Curvularia* gave results similar to those obtained with *Alternaria* and *Brachysporium*. Eight cultures of *Gliomastix convoluta* tested were strongly cellulolytic, as were all of 11 of *Memnoniella echinata*.

The Tuberculariaceae were represented by three species of *Myrothecium*, of which *M. verrucaria* [ibid., xxvii, p. 258] and the very closely allied *M. roridum* are among the strongest cellulose decomposers yet found. A culture of *M. inundatum* showed weak or negative action.

Among the Sphaeropsidales, *Botryodiplodia theobromae* showed negative or very weak activity. Cultures of *Coniothyrium*, *Phoma*, and *Pyrenochaeta* were strongly active.

In the Ascomycetes, 15 cultures of *Chaetomium* [cf. ibid., xxv, p. 177] were tested, including *C. funicolum*, *C. globosum* [ibid., xxv, p. 40], and *C. indicum*. The results suggest that a given strain of any of these three species is likely to be about as strong cellulolytically as the standard strain USDA *1042.4*. Two cultures of *Thielavia sepedonicum* tested were about as active as the *Chaetomium* species.

WADE (G. C.). **Effect of some micro-organisms on the physical properties of Cotton Duck.**—*J. Coun. sci. industr. Res. Aust.*, xx, 4, pp. 459–467, 1 graph, 1947.

During the war, numerous specimens of tentage exhibiting loss of strength or of waterproofness were received from the New Guinea area, and tests were made with some of the moulds isolated to estimate their value for laboratory tests on rotproofness of cotton fabrics. The most active species in reducing tensile strength of untreated duck was found to be *Metarrhizium* sp. (culture from U.S.A.) [? *Myrothecium*: *R.A.M.*, xxvii, p. 258], which caused 100 per cent. loss of strength; other very strong cellulose digesters were *Memnoniella echinata*, *Stachybotrys atra*, and *Chaetomium globosum*, which caused 100, 100, and 95 to 100 per cent. loss of strength, respectively.

Tests were also made of the effect of different fungi on the waterproofness of cotton duck. These showed that *Aspergillus niger*, *A. penicilloides*, *A. ustus*, *A. glaucus*, and *A. flavus* caused extensive loss of waterproofness.

Other tests, using rotproofed cotton duck, demonstrated that *A. ustus* and *Penicillium* sp. were more mercury-tolerant than *A. niger*, while *A. ustus* appeared to be rather more copper-sensitive than *A. niger* or *Pencillium* sp.

BUSTON (H. W.) & BASU (S. N.). **Some factors affecting the growth and sporulation of Chaetomium globosum and Memnoniella echinata.**—*J. gen. Microbiol.*, ii, 2, pp. 162–172, 1 pl., 1948.

Experiments to determine the nutritional requirements of *Chaetomium globosum* and *Memnoniella echinata* [*R.A.M.*, xxv, p. 413; xxvii, p. 291] showed that the production of perithecia by *C. globosum* was delayed until the soluble sugar in the medium had been reduced to a very low concentration. *M. echinata* sporulated

in the presence of considerable concentrations of sugar when provided with adequate biotin [loc. cit.], but at low biotin levels no sporulation occurred until the soluble sugar supply was nearly exhausted. Outstanding stimulation of growth and accelerated and increased sporulation of *C. globosum* resulted from the addition of jute extract to the medium; the presence of various B-group vitamins therein had no effect. Of all the substances tested only biotin stimulated the growth of *C. globosum*, but this effect was very slight.

Gäumann (E.) & Arx (A. v.). **Antibiotika als pflanzliche Plasmagifte II.** [Antibiotics as plant plasma toxins II.]—*Ber. schweiz. bot. Ges.*, lvii, pp. 175–182, 2 graphs, 1947.

Of the antibiotics comprised in the present series of experiments [cf. *R.A.M.*, xxvi, p. 220], kojic acid derived from *Aspergillus flavus* and many other fungi was the least toxic to the plasma of *Spirogyra* and *Elodea canadensis*, a concentration of the order of 10^{-1} being requisite for the destruction of semi-permeability in the limiting layers. For clavacin, produced by *A. clavatus*, *Penicillium patulum*, *P. expansum*, &c., and penicillic acid (*P. cyclopium* and *P. puberulum*), the corresponding figure was $0{\cdot}5 \times 10^{-3}$ M, while juglon, a very powerful toxin extracted from walnut roots, bark, and fruits, was active down to a dilution of 10^{-7} M. Streptomycin (from *Streptomyces griseus*) was the sole substance to exert a differential action on the various organisms. At an initial strength of 4×10^{-5} M. enniatin [see next abstract] proved highly toxic, but its injurious effects were barely perceptible at 10^{-6} M. Penicillin (from *P. chrysogenum* and *P. notatum*) behaved similarly, its toxicity rapidly decreasing and failing altogether at 10^{-3} M.

Gäumann (E.), Roth (Stephi), Ettlinger (L.), Plattner (P. A.), & Nager (U.). **Enniatin, ein neues, gegen Mykobakterien wirksames Antibiotikum.** [Enniatin, a new antibiotic active against mycobacteria.]—*Experientia*, iii, 5, p. 202, 1947. [English summary.]

Enniatin [see next abstracts] is the designation of a new antibiotic isolated in crystalline form from the mycelium of *Fusarium orthoceras* var. *enniatum* n.var. (the diagnosis of which is reserved for future publication). In *in vitro* tests the substance, which is virtually insoluble in water, inhibited the development of *Mycobacterium paratuberculosis* (rat strain) and *M. tuberculosis* (human) at dilutions of 1 in 1,200,000 and 1 in 1,000,000 to 1 in 500,000, respectively.

Cook (A. H.), Cox (S. F.), & Farmer (T. H.). **Antibiotics produced by fungi, and a new phenomenon in optical resolution.**—*Nature, Lond.*, clxxi, 4106, p. 61, 1948.

Earlier studies by the first two workers and M. S. Lacey showed that a strain of *Fusarium lateritium* produced an antibiotic, lateritiin-I. Meantime, Gäumann *et al.* had, unknown to the writers, reported the production of enniatin [see preceding abstracts], apparently identical with lateritiin-I. Since the present paper was written the work of Plattner *et al.* [see next abstract] has been studied. Chemical analyses support the suggestion that enniatin and lateritiin-I are similar compounds, but there is no evidence that enniatin B [see next abstract] is present in the latter.

Plattner (P. A.), Nager (U.), & Boller (A.). **Über die Isolierung neuartiger Antibiotika aus Fusarien.** [Isolation of new antibiotics from *Fusaria*.]—*Helv. chim. Acta*, xxxi, pp. 594–602, 1948.

The authors isolated from five strains of *Fusarium*, all of which inhibited *Mycobacterium* spp., two new antibiotics, designated enniatin A (from *F. ortho-*

ceras var. *enniatin* and *F. scirpi*) identical with lateritiin-I [cf. preceding abstract], and enniatin B.

Hirsch (A.). **An apparatus made from meccano parts for the preparation of roll-tube cultures.**—*J. gen. Microbiol.*, ii, 2, pp. 123–125, 1 pl., 1948.

A description is given of a simple apparatus, based on a commercial model and constructed from meccano parts, for the preparation of roll-tubes, which can replace Petri-dishes for counting and isolations of single colonies. The test-tubes are thinly coated internally with inoculated agar by rotating in the machine. The colonies are counted with the tube set in a slowly rotating support against a black background. Streak-tubes can be readily prepared by means of this equipment.

Jensen (L. B.). **Mustiness in foods.**—*Food Res.*, xiii, 2, pp. 89–93, 1948.

In this paper the author briefly reviews and discusses the subject of mustiness in foods, with numerous references to the relevant literature. Species of *Pseudomonas*, *Achromobacter*, and *Actinomyces* are most frequently the causal organisms. Foods commonly affected are eggs, fish, veal, lamb, pork, grains, potatoes, nut meats, milk, butter, cheese, and poultry meats. Moist foods when affected usually contain *Achromobacter perolens* or *Pseudomonas graveolens*. *A. perolens* may prove useful as a test organism for the presumptive determination of antiseptic and germicidal properties of chemical compounds, even slight growth of this organism in the medium being accompanied by perceptible mustiness.

Frank (Mary C.), Calam (C. T.), & Gregory (P. H.). **The production of spores by Penicillium notatum.**—*J. gen. Microbiol.*, ii, 1, pp. 70–79, 1948.

Penicillium notatum was ascertained to give high spore yields on media containing carbohydrates, ammonia, and an organic acid such as citric, tartaric, or succinic. Within certain limits the number of spores produced depended almost entirely on the volume of the medium, i.e., the spore yield per unit area of surface depended on the depth of the medium. Increase in the concentration of metabolites above normal level did not greatly increase spore yield, and the addition of further nutrients to a previously used medium gave only a small second crop. Spore production was, apparently, limited by the accumulation of toxic substances in the medium.

Scurti (J.). **Sulle variazioni che l'apparato conidico di alcuni Aspergilli subisce in substrati differenti.** [On the variations in the conidial apparatus of certain *Aspergilli* on different culture media.]—*Ann. Sper. agr.*, N.S., ii, 1, pp. 101–106, 1948. [English summary.]

Observations on the changes occurring in the conidiophores of *Sterigmatocystis* [*Aspergillus*] *versicolor*, *Aspergillus wehmeri*, *Eurotium* [*A.*] *repens*, and *A. glaucus* when grown on different media showed that the size of the distal vesicle varied according to the composition of the medium, the increase being proportional to increase in the amounts of salts and sugars present. On sawdust moistened with 5 per cent. potassium nitrate solution or in a solution containing 4 per cent. potassium nitrate, 1·5 per cent. potassium dihydrogen phosphate, and 1·5 per cent. saccharose, the vesicles were about half the size of those on nutrient agar. It thus appears that the development of *Aspergillus* is affected by the amount of nutrient present in the medium, and not the amount of water at the disposition of the fungus. On poor media the vesicles may disappear, the fungus then resembling a *Citromyces* or a *Penicillium*. Conidial size was not affected by the different media, but some differences were noted in the patterns present

on them. No increase in size of vesicles or conidia occurred in β-indoleacetic acid.

Gäumann (E.) & Nef (U.). **Der Einfluss der Temperatur auf die enzymatische Leistungsfähigkeit zweier Pflanzenpathogener Pilze.** [The influence of temperature on the enzymatic efficiency of two plant-pathogenic fungi.]—*Ber. schweiz. bot. Ges.*, lvii, pp. 258–271, 7 graphs, 1947.

In a pectin- and glucose-containing medium *Botrytis cinerea* produces pectases [*R.A.M.*, xxvi, p. 313] only within a temperature range of 3° to 27° C. and pectinases solely between 3° and 30°; below 3° and above 27° or 30°, only the glucose is used as a carbohydrate source. Under the experimental conditions selected, therefore, the temperature range for pectase and pectinase production by the fungus is considerably narrower than that for vegetative growth (36°) while pectase activity extends over a span of 70°. Within the temperature range permitting the production of the enzymes in question, pectase production per unit of mycelial weight is two to three times heavier at 6° than at 15° to 24°, which is more conducive to mycelial growth. On the other hand, pectinase production by *B. cinerea* appears to run more or less parallel with vegetative development.

In the same medium *Aspergillus niger* produces pectase and pectinase only at temperature ranges of 10° to 27° and 10° to about 30°, respectively; below and above these points, as in the case of *B. cinerea*, glucose is the sole carbohydrate source utilized by the mould. The range over which *A. niger* forms pectase and pectinase in the presence of dextrose is only about a third of that for vegetative growth. Within the prescribed limits both pectase and pectinase are considerably more abundant (3 and 50 times, respectively) per unit of mycelium at temperatures round about 12° than at 18° to 24°, promoting vegetative growth.

Brown (W.), Brooks (F. T.), & Bawden (F. C.). **A discussion on the physiology of resistance to disease in plants.**—*Proc. roy. Soc.*, Ser. B., cxxxv, 879, pp. 171–195, 1948.

Dealing with the physiology of facultative parasites, the first author, after distinguishing between facultative and obligate parasites, outlines what is known about the aggressive mechanism of such organisms as *Botrytis cinerea*, *Rhizoctonia* [*Corticium*] *solani*, *Pythium debaryanum*, and *Bacterium carotovorum* [*Erwinia carotovora*], and also indicates how the plant is able to oppose such action, the subject being treated in three phases, (1) the pre-penetration phase, (2) the process of penetration, and (3) the post-penetration phase.

The second author deals with host resistance to fungi, chiefly in relation to obligate parasites. He discusses resistance due to structural features of the host, e.g., in Webster wheat, profuse development of sclerenchyma in the stem checks mycelial growth of *Puccinia graminis*. He also refers to instances in which, in rust attacks, the host-parasite relationship is essentially bound up with the protoplasmic qualities of the two organisms, e.g., wheat and infection by *P. glumarum* and *P. triticina*. Other examples adduced to illustrate the author's views are *Erysiphe graminis* on cereals and grasses, and potato wart (*Synchytrium endobioticum*), while the defensive mechanism of the host is also discussed in the case of plum silver leaf (*Stereum purpureum*), and root rot of various trees due to *Armillaria mellea*. Changes in resistance induced in different ways are also considered.

The third author describes and discusses some effects of host-plant physiology on resistance to viruses, dealing in particular with variations in the degree and type of resistance shown towards viruses by susceptible hosts. The most reasonable index of susceptibility for virus diseases is probably the individual plant rather than any standard area of leaf or volume of extract.

Botjes (J. O.). **Verandering van de ziektesymptomen in Aardappelplanten, lijdende aan het A-virus.** [Alteration of the disease symptoms in Potato plants suffering from virus A.]—*Tijdschr. PlZiekt.*, liv, 1, pp. 13–15, 1948. [English summary.]

It was observed from time to time that isolated virus-A-infected plants of Eigenheimer potatoes, in a field kept under continuous cultivation from 1923 to 1947 at the Oostwold Experimental Station, displayed much milder symptoms and looked considerably more robust than the rest of the crop. In 1941 tubers of some of these mildly affected plants were planted separately and a few of them produced offspring with both severe and slight symptoms. Tubers of the latter were again planted separately, and gave rise in 1943 to a much larger proportion of plants with the attenuated form of the disease. Similar results were obtained in 1944, but not until 1945 were the severe symptoms wholly eliminated from the crop.

Plugs from tubers of plants showing the mild symptoms were inserted in 30 tubers of the susceptible Duivelander variety. All gave rise to plants showing milder symptoms than those raised from tubers grafted with the severe strain. That the virus is actually a weak form of A, and not a separate entity, was shown by a grafting experiment on Eigenheimer tubers infected by stipple streak [potato virus Y]. In similar previous tests the insertion of plugs from tubers with virus A into Eigenheimers with potato virus Y [*R.A.M.*, xvi, p. 552] led to the development of dwarf mosaic in the progeny. This complex disease resulted irrespective of the origin of the grafting material whether from plants attacked by the strong or weak strains of virus A. Eighteen out of 30 virus-Y-diseased Eigenheimer tubers grafted with tuber tissue containing the attenuated strain of A produced plants with dwarf mosaic. Hence it is concluded that a strain of virus A was responsible for the mild symptoms observed in the experimental field of Eigenheimers.

Downie (W. A.). **Seed Potato certification. List of growers, 1948.**—*J. Dep. agric. Vict.*, xlvi, 5, pp. 215–216, 1948.

In the introduction to this list of growers of certified seed-potato crops it is stated that a high proportion of the crops submitted from all districts of Victoria were affected with bacterial wilt (*Bacterium* [*Xanthomonas*] *solanacearum*) [*R.A.M.*, xxvi, p. 123; xxvii, p. 96], infection being highest in the variety Sebago. As the disease is tuber borne, great care has been taken to certify only disease-free crops.

Bawden (F. C.) & Kleczkowski (A.). **Variations in the properties of Potato virus X and their effects on its interactions with ribonuclease and proteolytic enzymes.** —*J. gen. Microbiol.*, ii, 2, pp. 173–185, 1948.

The main difficulty in purifying potato virus X [*R.A.M.*, xvii, p. 619] is its tendency to become insoluble when concentrated by precipitation with acid and salts or by high-speed centrifugation. Insolubility is correlated with the aggregation of virus particles which become entangled. The virus remains infective and serologically active.

Insoluble preparations dissolve slowly when incubated with pH 7·5 borate buffer and rapidly with trypsin or chymotrypsin, the latter being more effective, but different strains of the virus vary in their susceptibility to hydrolysis by the enzymes.

Ribonuclease [ibid., xxi, p. 392] combines with the virus and reversibly inhibits infectivity. At pH 7 the addition of the enzyme to soluble virus preparations causes loss of anisotropy of flow, a fall in precipitin titre, and the production of an insoluble complex. Incubation at pH 7·5 with borate buffer slowly dissolves the complex and restores the original properties of the virus. Trypsin increases the rate of re-solution. Incubation with borate buffer resulted in partial decomposition

of some virus preparations, the rate of decomposition being sometimes increased in the presence of ribonuclease.

Darling (H. M.). **Ring rot survey 1940–1947.**—*Amer. Potato J.*, xxv, 2, pp. 44–47, 1948.

A survey was made of the incidence of potato ring rot [*Corynebacterium sepedonicum*: *R.A.M.*, xxvii, pp. 37–39] in areas producing certified seed in twenty-one of the United States for the period 1940–47. Percentage estimates were based either on the acreage rejected owing to ring rot compared with that entered for inspection or on the number of fields rejected. The results showed that a certain measure of control was obtained from 1940 to 1942, when the average figures for all the States for the three years were 6·1, 4·9, and 3·77 per cent., respectively. From 1943, however, the amount reported increased annually to 14·84 per cent. in 1946, this increase being general from the extreme north-east to the western Great Plains States. In 1947 the percentage was 7·27.

It is suggested that tubers in storage should be examined more frequently and samples tested in the greenhouse in winter. At present control measures in all States are based on the use of clean seed and a sanitation programme. These should be maintained until immune varieties can be developed. It is emphasized that many aspects of the problem of continued increase need careful study and analysis.

Starr (G. H.) & Riedl (W. A.). **A comparison of Corynebacterium sepedonicum inocula from resistant and susceptible Potato varieties.**—Abs. in *Amer. Potato J.*, xxv, 2, p. 59, 1948.

Tests made in Wyoming during 1946 and 1947 in which tubers of Bliss Triumph, Red McClure, and Teton potatoes infected with *Corynebacterium sepedonicum* [*R.A.M.*, xxvi, p. 166 and preceding abstracts] were used to inoculate healthy tubers of these three varieties and Burbank, all of which vary considerably in susceptibility to ring rot, showed that both the percentage and the severity of ring-rot infection caused by inocula from susceptible varieties was equal to, if not greater than, that from the resistant varieties. More bacteria were present in Red McClure, Bliss Triumph, and Burbank than in Teton. The results showed that bacteria infecting Teton and ring-rot-resistant seedlings were not more pathogenic than those infecting the susceptible Bliss Triumph.

Andreae (W. A.). **The isolation of a blue fluorescent compound scopoletin, from Green Mountain Potato tubers, infected with leaf roll virus.**—*Canad. J. Res.*, Sect. C, xxvi, 1, pp. 31–34, 1 graph, 1948.

A crystalline, fluorescent substance occurring in potato tubers during the first year of infection with leaf-roll virus [*R.A.M.*, xxvii, p. 34] was isolated from infected Green Mountain tubers by a modification of Best's method (Studies on a fluorescent substance present in plants. 2. Isolation of the substance in a pure state and its identification as 6-methoxy-7 hydroxy 1 : 2 benzo-pyrone.—*Aust. J. exp. Biol. med. Sci.*, xxiii, pp. 251–255, 1944). It was identified as scopoletin, the same compound as Best isolated from tobacco plants infected with tomato spotted wilt virus [ibid., xvi, p. 133].

Rieman (G. H.) & Hougas (R. W.). **Resistance of new Potato varieties to common scab in Wisconsin.**—Abs. in *Amer. Potato J.*, xxv, 2, p. 59, 1948.

Field experiments carried out in Wisconsin for four years have shown the potato varieties Ontario and Menominee [*R.A.M.*, xxvii, p. 34] to compare favourably with Hindenburg in resisting common scab (*Actinomyces scabies*). Russet Sebago

showed significantly more scab resistance than its parent Sebago [ibid., xxvii, p. 85].

Hoyman (W. G.). **Potato-vine killers.**—Abs. in *Amer. Potato J.*, xxv, 2, p. 52, 1948.

In experiments made during the past three years in the Red River Valley of North Dakota, weed killer X1 (potassium cyanate), sinox general [*R.A.M.*, xxvi, p. 78], ammonium sulphate plus diesel oil, and dowspray 66 improved [ibid., xxvi, p. 561] plus aluminium sulphate all proved successful as potato haulm killers when applied as sprays. The amount of vascular disoloration in tubers harvested from treated plants was positively correlated with rapidity of kill and was also dependent on the amount of moisture available during the growing season and the stage of maturity at the time of spray application. Tubers from untreated plants cut at ground level also showed vascular discoloration.

Locke (S. B.). **Field resistance to leaf roll infection in Potato varieties.**—*Amer. Potato J.*, xxv, 2, pp. 37–43, 1948.

This is a full account of the reaction of potato varieties to infection by the leaf roll virus [*R.A.M.*, xxvi, pp. 165, 259] already noticed from the Washington report [ibid., xxv, p. 384]. It is the most destructive potato disease in that area. Results obtained where leaf roll increase was greatest showed that Katahdin was the most resistant variety with an average leaf roll increase of only 16 per cent.; Sequoia being next with 26·7 per cent. A considerable portion of the acreage in Washington previously under the susceptible Netted Gem (Russet Burbank) has been planted with the more resistant White Rose (38 per cent.), which also does not develop net necrosis in the tubers. It appears that the daily maximum temperature is of great importance in affecting the rate of field spread of leaf roll through its effect on aphid flights.

Hovey (C.) & Bonde (R.). **Physalis angulata L. a test plant for the Potato leaf roll virus.**—Abs. in *Amer. Potato J.*, xxv, 2, p. 52, 1948.

About ten days after inoculation with aphids carrying the potato leaf roll virus, *Physalis angulata* [see next abstract] develops severe stunting with chlorosis and mottling of the leaves typical of severe leaf roll infection. Advantages over the potato as a test plant are that it is easily propagated in the greenhouse from true seed, is relatively small, and the virus is readily detected in it ten days after inoculation.

Kirkpatrick (H. C.). **Indicator plants for studies with the leaf roll virus of Potatoes.** Abs. in *Amer. Potato J.*, xxv, 2, p. 53, 1948.

Transmission experiments with potato leaf roll virus into seedlings of *Datura stramonium*, *Physalis angulata* [see preceding abstract], and *P. floridana* readily caused distinct symptoms, transmission percentages for each plant from single insect (*Myzus persicae*) feedings being 20 to 40, 50 to 70, and 70 to 90 per cent., respectively. In some cases 100 per cent. transmission has been obtained with *P. floridana*. Seedlings of these plants will make useful indicators for the virus.

Hardenburg (E. V.). **Current Potato research in North America.**—*Amer. Potato J.*, xxv, 5, pp. 183–190, 1948.

This inventory of the various types of potato research projects now current throughout Canada and the United States is classified under various headings, such as breeding, disease control, variety tests, and vine and weed killers, under each of which the subject matter is sub-classified and the States and Provinces concerned specified.

Folsom (D.), Getchell (J. S.), & Bonde (R.). **Bacterial red xylem disease of Potato tubers in Maine.**—*Plant Dis. Reptr*, xxxii, 6, pp. 230–231, 1948. [Mimeographed.]

Potato tubers in Maine show at harvest time and in storage a reddish discoloration (antimony yellow to ochraceous tawny in Katahdin) of the xylem and often a depressed, but not discoloured, corrosion of the tissue at the stolon scar, caused by an unnamed bacterium the characters of which are described. Affected tubers are often of a large size.

Freshly cut tuber slices smeared with broth cultures of the organism in fairly humid air developed brown to black lesions several cm. in diameter and several mm. or even cm. deep. In saturated air in Petri dishes a shallow yellow rot, tinged more or less with black, developed rapidly. The pathogen has been isolated from various parts of infected tubers. It has been reisolated from the lesions and xylem of inoculated tissue and successfully used for reinoculations. The data indicate that the organism often enters the tuber from the parent plant, but the perpetuation of the disease through infected seed tubers could not be demonstrated, because the pathogen disappears from the xylem during the storage period.

Henry (B. W.) & Andersen (A. L.). **Sporulation by Piricularia oryzae.**—*Phytopathology*, xxxviii, 4, pp. 265–278, 1 fig., 2 diags., 1 graph, 1948.

The course of spore formation by *Piricularia oryzae* in pure culture was found to be similar to that on the host [*R.A.M.*, xxvi, p. 315]. Profusely sporulating isolates were usually olive-grey with a 1 to 3 mm. layer of aerial hyphae, while those producing fewer conidia were paler or nearly white, with a hyphal layer of 3 to 10 mm. The tendency to copious sporulation was best maintained by storage under mineral oil at 6° to 8° C. Of the several agar and whole-seed substrata suitable for spore production, the best were 2 per cent. rice-polish agar and a 1 : 1 mixture of oats and sorghum. Spore yields increased with rising concentrations of inoculum up to an optimum range, viz., 50,000 conidia per ml. for the agar and 200,000 for the oats–sorghum. Abundant sporulation was further promoted by moisture contents approaching saturation for the whole-grain media and the surrounding atmosphere. Forced aeration was essential for sporulation by *P. oryzae* in vessels larger than the ordinary test tube, the optimum rate for the process being about 4 c.c. air per minute per gm. oats–sorghum.

The length of the incubation period required for maximum sporulation varied with the temperature, type of culture vessel used, and, to some extent, with the isolate. At the optimum temperature of 28°, for instance, one isolate reached its maximum in nine days, with the most rapid sporulation between the third and fifth, while another pursued a similar course up to the fifth day and then showed no further increase. On the oats–sorghum medium sporulation in cultures incubated for three or four days in milk bottles before transference to aerated vessels, rose to a peak after four days in the latter, making a total of seven to eight days, whereas in those incubated in aerated Fernbach flasks the maximum was reached by the sixth day. The optimum pH for conidial production ranged from 4·9 to 7·5.

Considerable variations in the quantity of spores produced in a given environment occurred among some 100 different isolates of *P. oryzae* obtained by host passage of the original strain, followed in many cases by single-sporing. It has, however, proved possible to maintain the high-sporulating character of certain isolates for three years by means of host passage.

Martin (J. P.). **Pathology.**—*Rep. Hawaii Sug. Exp. Sta., 1946–7* (ex *Printed Reps. Hawaii Sug. Pl. Ass., 1947*), pp. 23–30, 1947.

It is stated in this report [cf. *R.A.M.*, xxvii, p. 95] that the Hawaiian sugarcane varieties 37–7202, 38–2915, 32–9624, and 33–9405 have contracted Fiji disease [ibid., xxvii, p. 97] in Samoa, the first symptoms appearing three to five months

after planting. Not a single case of mosaic [sugar-cane mosaic virus: ibid., xxv, p. 523] has been found on 37–1933, 32–1063, and 32–8560; these three varieties constitute over 85 per cent. of the stands in Hawaii. Eye spot [*Helminthosporium sacchari*] is no longer a problem. Leaf scald [*Xanthomonas albilineans*] caused serious damage to Yellow Caledonia. It has not been noted on 32–1063; one case was reported on 37–1933 and a few on 32–8560. Chlorotic streak is still of major importance in low-lying and badly drained districts. Selection of healthy planting material, and hot-water treatment of that infected or questionable, is recommended. Brown stripe [*Cochliobolus stenospilus*] has declined, generally, in virulence, but occurred, moderately to severely, in a few localized areas on 32–8560.

C. A. Wismer states that in tests in which red and white varieties of cactus [? *Opuntia megacantha*] were inoculated with four *Fusarium* spp., namely, Carpenter's *Fusarium* (No. 16), the Maui *Fusarium* (No. 27) [ibid., xxvii, p. 95], and two isolates (received from the Board of Agriculture and Forestry) '*Fusarium* sp.' and 'Kauai white', the last isolate proved most pathogenic, causing rotting of red cacti one month after inoculation. None of the strains caused rotting of white cacti.

Continuing his work on the transmission of chlorotic streak disease [loc. cit.] D. M. Weller recognizes three stages: A, the presence, B, the disappearance, and C, the reappearance of leaf symptoms. No transmission occurred when the roots of diseased plants were in contact with healthy ones in water cultures, and in pots of soil. When nymphs of leafhoppers (*Draeculacephala minerva*) were transferred from diseased to healthy plants, five cases of streak developed; the symptoms were of the type where the lesions begin to disappear (stage B).

Chilton (S. J. P.), Steib (Rene), & Mills (P. J.). **Red rot of Sugar Cane.**—*Sug. J., N.O.*, x, 1, 1947. [Abs. in *Sugar*, xliii, 6, p. 50, 1948.]

To determine whether or not the causal organism of sugar-cane red rot [*Physalospora tucumanensis*] was present on or in the standing cane in Louisiana [*R.A.M.*, xxvi, p. 30] apparently healthy stalks were sterilized with mercuric chloride and washed with calcium hypochlorite solution; portions of the material thus treated as well as plugs from the root bands were plated on oatmeal agar. Notwithstanding the drastic sterilization the cultures showed infection in up to 17·5 per cent. of all the stalks examined, suggesting that the fungus was either under the waxy covering of the cane buds or in the tissues inaccessible to the fungicides.

Diseased canes in the field usually show a reddening of the interior of the leaf sheaths where they have pulled away from the lower part of the stalk, no discoloration being present on the upper part to which the sheaths adhere tightly. Plating experiments showed that the tight sheath protects the buds and root bands from contamination by the pathogen. Several commercial plantations of Co. 290 and C.P. 34/100 varieties were inspected from this standpoint, and a fairly high percentage of infection was found in the scales covering the buds.

Twenty minutes' immersion in water heated to 52° and 54° C. failed to eliminate *P. tucumanensis*, which also proved resistant to 30 and 40 minutes' treatment with 1 in 1,000 solution of mercuric chloride and 23 to 30 days' storage at 70° F. Spergon, phygon, and tersan were likewise ineffectual against the fungus in the above-mentioned susceptible varieties. On the very resistant C.P. 36/13 and 36/105, however, no infected nodes were observed. New estimates indicate that the losses from red rot may amount to 37 to 64 per cent. of the crop in susceptible varieties, 21 to 38 in moderately susceptible, and 2 to 15 in the most resistant.

King (N. J.). **Fiji disease in the Maryborough district.**—*Proc. Qd Soc. Sug. Cane Technol., 1948*, pp. 165–169, 1948.

When sugar-cane Fiji disease [*R.A.M.*, xxvii, pp. 97, 384, and next abstract] was first recorded in Queensland in 1926 [ibid., v, p. 632] control measures were

recommended, and a proclamation was issued prohibiting the introduction of cane plants from New South Wales and the removal of canes from certain counties.

In spite of these precautions, rapid spread continued in Maryborough and the adjacent areas. By 1937, the badly infected parts of Maryborough had reached the stage where the only hope lay in the use of resistant varieties. For several years, Co. 290, Q. 813, and H.Q. 285 were the major canes in these areas, and incidence began to fall. In 1946–7 only 29 diseased stools were found compared with 5,324 in 1939–40. In the Island Plantation division a remarkable decline followed the substitution of M. 1900 Seedling and D. 1135 by Co. 290, Q. 813, H.Q. 285, and Oramboo. By 1943 no Fiji disease was present in this locality, and by the middle of 1947 a complete clean-up appeared to have been made also in Granville, Saltwater Creek, Prawle, the Pocket, and the entire Bauple and Tiaro areas, while at Bidwell and Magnolia no disease has been noted since 1941. In Yerra and Antigua no affected stools have been found since 1946. However, in the Pialba–Nikenbah–Urraween–Takura area in 1939–40, 284 diseased stools were found, and in each of the next three years over 200, mainly of the widely grown varieties P.O.J. 2878 and Q. 25. In 1944 a proclamation quarantined all farms in the Pialba area and prohibited any farmer from using his own cane plants except by permission of an inspector. There were fewer than 100 diseased stools in each of the next three years and only seven in 1946–7. Drought also assisted in reducing incidence. In the Pialba and Bauple districts the mastery of the disease, when complete, will have been attained by a combination of roguing, planting control, and drought. The elimination of susceptible varieties by legislation, which has been the chief means of control in the badly infested areas contiguous to Maryborough, is clearly the most successful and expeditious method of control. The advantage is that its rapidity allows the re-introduction of the susceptible canes after a short period, when the risk of re-infection has become slight. This has been done on the Island Plantation, where M. 1900 Seedling was planted in restricted acreages three years ago. At present though nearly half the Maryborough crop is obtained from P.O.J. 2878, incidence is now so reduced that the disease no longer constitutes a threat to the industry, although vigilance is still necessary as these very susceptible varieties are being grown. The cost of the operations of the Cane Pest and Disease Control Board amounts to only three halfpence per ton of cane to the grower.

Hughes (C. G.). **The Bureau quarantine house.**—*Proc. Qd Soc. Sug. Cane Technol., 1948*, pp. 21–25, 2 figs., 1948.

After noting that sugar-cane Fiji disease [see preceding abstract] has not been found in North Queensland and that downy mildew [*Sclerospora sacchari*: loc. cit.] has not been recorded south of Bundaberg, the author states that to prevent the transfer of sugar-cane diseases from one part of the State to another, Queensland has been divided into ten quarantine districts, the transfer of cane plants from one of these districts to any other being allowed only under permit from the Bureau of Sugar Experiment Stations, Brisbane. When any risk of disease exists, the cane is transferred through the Bureau quarantine house [the special construction of which is described], unless the receiving district possesses a plot remote from commercial fields where the introduced cane can be kept under observation. The house receives imports of cane from overseas as well as canes passing from one local quarantine district to another. Since the first plantings were made in the house in 1935, 52 canes have been brought in from countries outside Australia, and several more are expected to arrive shortly. Canes imported before 1941 have been tested for resistance to Queensland diseases and grown for comparison with standard local canes. CP 29/116, imported in 1935, is one of the most valuable introductions, over 420,000 tons of this variety being harvested in Queensland in 1947.